

Chapter 5. Biological Resources Management

5.1 Wetlands Management

Wetlands are an integral part of healthy ecosystems, providing several important functions including moderating extremes in water flow, aiding natural purification of water, and maintaining and recharging groundwater. Wetlands are nursery areas for many terrestrial and aquatic animal species. In addition to their important ecological functions, wetlands are high in aesthetic value and support a variety of recreational activities such as fishing, hunting, and bird watching.

Wetlands are periodically or permanently inundated by surface water and are characterized by saturated soils and vegetation adapted for life in saturated soils (USACE, 1985; Executive Order [EO] 11990).

5.1.1 Wetlands Management Program Goals

Wetlands management goals all contribute to one or more of the overall natural resources program goals of stewardship, military training support, compliance, quality of life, and integration. The wetlands management goals for Fort Richardson are:

- Implement an effective wetland management plan that will maintain and enhance the health, productivity, and biological diversity of wetland ecosystems.
- Attain goals by applying management prescriptions listed in the Wetlands Management Action Plan.
- Ensure that USARAK is in compliance with all applicable federal and state laws and regulations regarding wetlands.
- Provide wetland areas for realistic military training, while maintaining ecosystem integrity and minimizing impacts to wetlands.
- Distribute wetland management prescriptions to all Fort Richardson user groups: military, recreationalists, Directorate of Public Works, and Alaska Fire Service.
- Promote early coordination between installation staff and the Environmental Resources Department (ERD) to prevent adverse impacts to wetlands.
- Provide a customer-friendly process to initiate wetland permits for military exercises or construction.

Wetlands management on Fort Richardson is implemented on the belief that effective military training can be accomplished with minimal long-term environmental damage, while also complying with applicable laws and regulations. Effective training and environmental stewardship are compatible and necessary for the maintenance of a quality military training environment and protection of sensitive wetland areas.

5.1.2 Wetlands Management Plan

Wetlands program management and planning includes all the planning, budgeting, contract oversight, and organization necessary to implement the wetlands management program. The primary emphasis for this component of the wetlands management program is to prepare and update a wetlands management plan for Fort Richardson.

Description and Justification: Prepare, update, and implement a wetlands management action plan for Fort Richardson. Due to the importance and extent of wetlands found on Fort Richardson, a wetlands

management plan is necessary to give direction and establish policy for the use, maintenance, and restoration of wetlands. This document supports the military mission and works in conjunction with the Fort Richardson Integrated Natural Resources Management Plan (INRMP). Implementation of an effective wetland management action plan would maintain the health, productivity, and biological diversity of wetland ecosystems. Updates of the wetlands management action plan are required by Public Law 106-65 (Military Land Withdrawal Act) as mitigation for the land withdrawal LEIS and Public Law 86-797 (Sikes Act) every five years to implement the INRMP. Per Memorandum DAIM-ED-N, 21 March 1997, this component of the INRMP is a class 1 requirement.

Measures of Effectiveness:

- Complete, update, and maintain a wetlands management action plan.
- Effectively protect sensitive wetlands, while allowing military use in low-function wetlands.
- Involve the resource agencies in the wetlands management planning process, and the public in review of the plan.

Management History: The first wetlands management action plan was completed in 2001.

Current Management: Current management actions to update the wetlands management plan will cease in 2002. If this INRMP is not approved and funded, no new wetlands management plan will be prepared, updated, or implemented. Policies already in place in the current wetlands management plan will continue.

Proposed Management: Prepare and update the wetlands management action plan for Fort Richardson as outlined in Table 5-1.

Table 5-1. Wetlands Management Action Plan.

OBJECTIVE	RESPONSIBLE FOR IMPLEMENTATION	PRIORITY	IMPLEMENTATION				
			2002	2003	2004	2005	2006
Prepare annual updates of the wetlands management action plan	USARAK Natural Resources	High	x	x	x	x	x
Prepare and update wetlands management action plan for the planning period of 2007-2011.	USARAK Natural Resources	High					x
Complete NEPA documentation for update	USARAK Natural Resources	High					x

Other Management Alternatives Considered and Eliminated: There are no alternatives to maintaining a current wetlands management action plan with scheduled updates at least every five years. NEPA documentation is also legally mandated.

5.1.3 Wetlands Inventory and Monitoring

5.1.3.1 Wetlands Monitoring

Wetlands monitoring concentrates on wetlands areas that have been used for maneuver training. Approximately 50,000 acres of Fort Richardson are available for maneuver use. This use includes general

field training exercises such as military maneuvers, bivouac (camping) activities, and live fire operations from permanent firing ranges. Military training typically involves the movement of tracked or wheeled vehicles across road-less terrain. Foot traffic is also classified as a training activity. Almost all military training tasks involve a maneuver component, and can take place both on and off-road. The goal of wetlands monitoring at Fort Richardson is to quantify the extent and severity of disturbance to wetlands from both military and civilian land-use.

Description and Justification: The Alaska Region Land Condition-Trend Analysis (AKLCTA) program is utilized to monitor military and non-military use of wetlands at Fort Richardson (see Section 4.1.3 above). LCTA is a component of the Integrated Training Area Management (ITAM) program. Through AKLCTA, land condition information is collected on Fort Richardson training lands, including wetlands. Among other variables, surveyors look for the type of use and any physical damage to the landscape. Conducting wetlands monitoring is required by Public Law 86-797 (Sikes Act) to implement the INRMP.

Measures of Effectiveness:

- Identify severity and quantify extent of wetlands disturbance from military and non-military sources.

Management History: LCTA has been monitoring disturbance in wetlands since 1997. Aerial surveys for wetlands disturbance have been conducted since the 1970s.

Current Management: Use of wetlands on Fort Richardson is monitored through the existing AKLCTA program. In addition to quantitative monitoring through AKLCTA, ERD staff continues to conduct qualitative assessments of use during large military training field exercises. This effort prevents undue wetlands damage and ensures quick and proper wetland reclamation, where necessary. Recreational use of wetlands is also monitored through the LCTA program and through observation by the ERD staff.

Proposed Management: Apply for a general wetlands permit for military training at Fort Richardson from the US Army Corps of Engineers, so as to avoid the necessity of acquiring individual permits for specific training events. Continue the monitoring of wetlands use on Fort Richardson as outlined in Table 5-2.

Table 5-2. Wetlands Monitoring.

OBJECTIVE	RESPONSIBLE FOR IMPLEMENTATION	PRIORITY	IMPLEMENTATION				
			2002	2003	2004	2005	2006
Use AKLCTA methodology to monitor military use of wetlands.	USARAK Natural Resources	High	x	x	x	x	x
Continue to monitor large military training field exercises	USARAK Natural Resources	High	x	x	x	x	x
Use AKLCTA methodology to monitor non-military use of wetlands	USARAK Natural Resources	High	x	x	x	x	x

Other Management Alternatives Considered and Eliminated: There are other potential methods of monitoring wetlands. The Alaska Region LCTA methods, however, were developed specifically for

vegetation and military disturbance monitoring in Alaskan ecosystems, and serve well to assess disturbance in wetlands.

5.1.3.2 Planning-Level Wetlands Inventory

Description and Justification: Conduct a planning-level wetlands inventory of Fort Richardson. The wetlands inventory includes a wetlands classification, a description of the functions and values of wetlands on Fort Richardson, and management recommendations. The National Wetlands Inventory failed to detect many of the smaller wetlands on Fort Richardson, which rendered it inadequate for installation natural resources management programs. A wetlands inventory on Fort Richardson is required for management of withdrawn public lands. An accurate planning-level wetlands survey is required by AR 200-3 and is required to implement this INRMP as mandated by Public Law 86-797 (Sikes Act). Per Memorandum DAIM-ED-N, 21 March 1997, this planning-level survey is a class 1 requirement.

Measures of Effectiveness:

- Complete, maintain, and update the planning-level wetlands survey for Fort Richardson.
- Identify the requirement for a planning-level wetlands survey in the EPR.

Management History: WES completed a wetlands inventory in 1996 (Lichvar and Specher, 1996). This inventory, combined with a functions and values analysis (also done by WES), was used to prepare the first wetlands management action plan in 2001.

Current Management: Two wetland inventories have been completed on Fort Richardson: the National Wetlands Inventory (NWI) by the USFWS and the Waterways Experiment Station (WES) inventory by the USACE. When making management decisions concerning wetlands, both inventories are utilized. In instances where a CWA Section 404 Individual or Nationwide Wetland Permit is required, the ERD staff will utilize both inventories prior to making initial site visits. If the proposed project area is within a wetland area, as confirmed by the inventories and a site visit, ERD staff will request a Jurisdictional Determination by the USACE. Ultimately, the USACE will conduct a site visit and complete a wetland delineation for the project area. The USACE will recommend the type of wetland permit application to submit.

Proposed Management: Update the planning-level wetlands inventory for Fort Richardson as outlined in Table 5-3.

Table 5-3. Planning-Level Wetlands Inventory.

OBJECTIVE	RESPONSIBLE FOR IMPLEMENTATION	PRIORITY	IMPLEMENTATION				
			2002	2003	2004	2005	2006
Update the planning-level wetlands survey.	USARAK Natural Resources	High					x

Other Management Alternatives Considered and Eliminated: There are no alternatives to maintaining a current planning-level wetlands inventory. Per the Sikes Act, AR 200-3, and Memorandum DAIM-ED-N, 21 March 1997, this planning-level inventory must be updated every ten years.

5.1.4 Wetlands Management

Description and Justification: Wetlands management entails managing military, recreational, and other use to minimize disturbance. Wetlands management also includes restoration of disturbed areas. Wetlands management will help maintain proper wetland functions while allowing military training and ensure that plant, wildlife, and soil resources are not degraded. Implementation of wetlands management will improve the quality of military training at Fort Richardson by providing realistic training options in wetlands, resulting in an overall increase training opportunities. In addition, conducting wetlands management activities will reduce the amount of planning time previously needed for wetland permit applications to train in wetlands. Wetlands management also establishes a basis for conservation and protection of wetlands. Conducting wetlands management is required by Public Law 86-797 (Sikes Act) to implement the INRMP.

Measures of Effectiveness:

- No net loss of wetlands during 2002-2006.
- No restriction in the amount of military training during 2002-2006.
- No Notices of Violation (NOV) from use of wetlands in 2002-2006.
- Minimize restrictions to training from wetlands management policies and issues.
- Coordinate with the USACE for all proposed actions that have the potential to impact wetlands.
- All mitigation measures identified in CWA Section 404 permits for natural resource management projects/plans are being implemented per the agreed schedule.

Wetlands Management Areas: The environmental limitations overlay system was developed as a tool for planning military training activities and managing wetlands. Map polygons depicting approved and restricted activities in wetland areas are listed in three color-coded categories that can be overlaid on existing maps of Fort Richardson. The environmental limitations overlay is available at each Range Control or in each ITAM office. ITAM or range staff provide instruction on use of the overlay. Each overlay is available in a summer and winter version. The three categories on the overlays are described in Tables 5-4 and 5-5 and in the paragraphs that follow these tables. The environmental limitations overlay is shown in Figure 5-1.

Table 5-4. Environmental Limitations Overlay, Summer Land-Use Category Definitions.

Category	Approved Activity SUMMER	Limited Activity (requires approval by Range Control on a case- by-case basis)	Prohibited Activity
GREEN No limitations or restrictions	<ul style="list-style-type: none"> - Tracked, wheeled and foot maneuvers - Bivouacs - Defensive fighting positions - Digging - Earth moving - Field kitchens - Laundry and bath facilities - Water purification - Portable latrines - Slit trenches - Vehicle decontamination training - Timber cutting (under 4" in diameter) - POL distribution 	<ul style="list-style-type: none"> - Smoke generation - Fuel farms 	None
YELLOW Minor limitations or restrictions	<ul style="list-style-type: none"> - Tracked, wheeled and foot maneuvers - Bivouacs - Assembly areas - Defensive fighting positions - Timber cutting (under 4" in diameter) 	<ul style="list-style-type: none"> - Digging - Earth moving 	<ul style="list-style-type: none"> - Laundry and bath facilities - Portable latrines - Slit trenches - Vehicle decontamination training - Smoke generation - Fuel farms - POL distribution

Category	Approved Activity SUMMER	Limited Activity (requires approval by Range Control on a case- by-case basis)	Prohibited Activity
RED Significant limitations or restrictions	- Foot maneuvers	- Tracked and wheeled maneuvers	- Bivouacs - Assembly areas - Defensive fighting positions - Timber cutting (under 4" in diameter) - Mechanical digging - Earth moving - Laundry and bath facilities - Portable latrines - Slit trenches - Vehicle decontamination training - Smoke generation - Fuel farms - POL distribution

Summer Special Conditions: The categories on these overlays each have special conditions that must be observed while training in those areas.

Green: No environmental restrictions. However all normal procedures outlined elsewhere in this regulation should be followed. Smoke generation and fuel farms in areas represented as green on the overlay require prior approval from Range Control on a case by case basis.

Yellow: Notify Range Control when planning to train in yellow areas. Environmental/ITAM Staff must pre-survey area. Stream crossings are permitted at 90 degree angles only.

Red: Notify Range Control when planning to use red areas. Environmental/ITAM Staff must pre-survey red area to determine on the ground limits of each red area. Open water and streams have 50 meter buffer - NO VEHICLES IN BUFFER - FOOT MANEUVER ONLY. Stream crossings at 90 degree angle to water flow only. No stream crossing at shear or cut banks. Vehicular maneuver is not allowed except during stream crossings, which must be crossed at a 90-degree angle to the direction of the stream flow. No stream crossing at shear or cut banks. Earth moving, mechanical digging, bivouacs, assembly areas, fighting positions, timber cutting, laundry and bath sites, portable latrines, slit trenches, vehicle decontamination, smoke generation, and any POL distribution are restricted in any area designated as red on the overlay.

Table 5-5. Environmental Limitations Overlay, Winter Land-Use Category Definitions.

Category	Approved Activity WINTER	Limited Activity (requires approval by Range Control on a case- by-case basis)	Prohibited Activity
GREEN No limitations or restrictions	- Tracked, wheeled and foot maneuvers - Bivouacs - Defensive fighting positions - Digging - Earth moving - Field kitchens - Laundry and bath facilities - Water purification - Portable latrines - Slit trenches - Vehicle decontamination training - Timber cutting (under 4" in diameter) - POL distribution	- Smoke generation - Fuel farms	None
YELLOW Minor limitations or restrictions	- Tracked, wheeled and foot maneuvers - Bivouacs - Assembly areas	- Digging - Earth moving - Snowplowing	- Laundry and bath facilities - Portable latrines - Slit trenches

Category	Approved Activity WINTER	Limited Activity (requires approval by Range Control on a case- by-case basis)	Prohibited Activity
	<ul style="list-style-type: none"> - Defensive fighting positions - Timber cutting (under 4" in diameter) 	<ul style="list-style-type: none"> - Stream crossings with ADF&G permit 	<ul style="list-style-type: none"> - Vehicle decontamination training - Smoke generation - Fuel farms - POL distribution
RED Significant limitations or restrictions	<ul style="list-style-type: none"> - Foot maneuvers 	<ul style="list-style-type: none"> - Tracked and wheeled maneuvers - Stream crossings with ADF&G permit 	<ul style="list-style-type: none"> - Bivouacs - Assembly areas - Defensive fighting positions - Timber cutting (under 4" in diameter) - Mechanical digging - Earth moving - Laundry and bath facilities - Portable latrines - Slit trenches - Vehicle decontamination training - Smoke generation - Fuel farms - POL distribution

Winter Special Conditions: The categories on these overlays each have special condition that must be observed while training in those areas.

Green: No environmental restrictions however all normal procedures outlined elsewhere in this regulation should be followed. Smoke generation and fuel farms in areas represented as green on the overlay require approval from Range Control on a case by case basis.

Yellow: Notify Range Control when training in yellow areas. Environmental/ITAM Staff must pre-survey area. Stream Crossings at 90 degree angles only. Use caution when snow plowing. Minimum of 6 inches of snow pack must remain on trails or other clearings to minimize damage to vegetation and soils. Activities limited in areas shown as yellow on the overlay include tracked and wheeled maneuvers, bivouacs, assembly areas, defensive fighting positions and timber cutting. These activities may be approved on a case by case basis by range control ITAM if there are no seasonal wildlife restrictions.

Red: Notify Range Control when using red areas. Environmental/ITAM Staff must pre-survey red area to determine on the ground limits of each red area. Open water and streams have 50 meter buffer - NO VEHICLES IN BUFFER - FOOT MANEUVER ONLY. Vehicular maneuver is not allowed except during stream crossings, which must be crossed at a 90-degree angle to the direction of the stream flow. No stream crossing at shear or cut banks. Earth moving, mechanical digging, bivouacs, assembly areas, fighting positions, timber cutting, laundry and bath sites, portable latrines, slit trenches, vehicle decontamination, smoke generation, and any POL distribution (fuel farms and tankers) are restricted in any area designated as red on the overlay.

Management History: Wetlands protection has been strengthened by the completion of a comprehensive post-wide wetlands inventory (Lichvar and Specher, 1996). Further studies to include wetland functions and values will also help provide information that will be useful in wetlands protection and enhancement.

Current Management:

Wetlands Use Management: To protect certain wetland areas and to prevent damage, USARAK developed the environmental limitations overlay system. (as described above). In addition to the overlay system, USARAK has implemented an Environmental Awareness (EA) program, in part to reduce damage to wetlands from maneuver or other training activities. A variety of materials and methods are

used to educate the military on a wide range of environmental issues, including wetlands. For example, educational briefings on environmental issues, including wetland identification, are held throughout the year and EA materials are presented at Range Control briefings, pre-command briefings and before all major field exercises. Training Requirements Integration (TRI) is another component of the ITAM program that is implemented to minimize damage to natural resources by integrating military training requirements with natural resources concerns. In the case of wetland management, TRI has been accomplished by range scheduling procedures and the use of environmental limitations overlays.

Following major exercises, USARAK staff prepares an After Action Report that details any significant occurrences during the exercise and distributes it to all participating units. This report serves as an educational document for the units to consider during their next large field exercise. Issues typically addressed in the report include wetlands damage, petroleum, lubricant and oil (POL) spills, trash and debris clean-up, snowplowing, refilling and recontouring of areas used for digging, etc.

In addition to military training, outdoor recreation can impact wetlands and wetland related species (Racine et al. 1998, and Racine 1998). These issues are addressed in the outdoor recreation management and action plan. Brief discussions of specific actions are also included in the wetlands management action plan in Appendix C.

The presence of wetlands has shaped the existing development on Fort Richardson and will continue to affect future development. Wetland areas have required and will continue to require special consideration for development. Specific goals and objectives for the future development of Fort Richardson are based on considerations of the installation mission and findings of significant on-post and off-post conditions. Future land-use requirements such as construction of buildings, parking areas, recreation facilities and future mission needs may require the filling-in of wetland areas to accommodate increased demands on existing land-use areas.

If the proposed project area is within a wetland area, as confirmed by existing wetland inventories and a site visit, ERD staff will request a Jurisdictional Determination by the USACE. Ultimately, the USACE will conduct a site visit and complete a wetland delineation for the project area. The USACE will recommend the type of wetland permit application to submit.

Wetlands Restoration: Wetland restoration projects will be coordinated through the Land Rehabilitation and Maintenance (LRAM) program, a component of ITAM (see Chapter 4, Section 4.1.4). Techniques for repairing wetlands damaged from military training include installing waterbars, re-contouring areas to match surrounding area, rolling back the vegetative mat, and revegetation.

The LRAM program is also used to identify and prioritize restoration activities in areas heavily impacted by recreational-use. Impacts resulting from recreational-use are similar to those resulting from military activities. Thus, similar rehabilitation measures can also be applied to these areas. Current restoration of recreational sites involves the maintenance of newly developed sites and the upgrade of locations to be developed for future recreational-use.

Road drainage maintenance is important for controlling sedimentation in wetland areas. Road maintenance on training lands is generally a responsibility of the Directorate of Public Works (DPW). Some maintenance work on roads and trails on Fort Richardson is done through the LRAM program.

In the case of wildfires, land rehabilitation activities commence immediately upon termination of fire suppression activities on Fort Richardson.

Ongoing projects in wetlands management include those projects funded in late in 2001 but not projected to be completed until 2002. If this INRMP is not approved and funded, wetlands management projects will cease after 2002.

Proposed Management: Conduct wetlands management on Fort Richardson as outlined in Table 5-6.

Table 5-6. Wetlands Management Projects.

OBJECTIVE	RESPONSIBLE FOR IMPLEMENTATION	PRIORITY	IMPLEMENTATION				
			2002	2003	2004	2005	2006
Apply for a five-year individual wetlands permit to allow military training in low function wetlands.	USARAK Natural Resources	High		x			
Apply for other CWA Section 404 wetland permits on an as needed basis.	USARAK Natural Resources	High	x	x	x	x	x
Update Environmental Pre-Approval Overlays and associated restrictions.	USARAK Natural Resources	High	x	x	x	x	x
Conduct wetlands determinations using National Wetlands Inventory (NWI) and Waterways Experiment Station (WES) Wetland Delineation.	USARAK Natural Resources	High	x	x	x	x	x
Implement AFS policy on prescribed burns in wetland areas	USARAK Natural Resources	High	x	x	x	x	x
Conduct rehabilitation activities on damaged wetlands following military use and after fire suppression activities.	USARAK Natural Resources	High	x	x	x	x	x
Conduct rehabilitation activities on damaged wetlands occurring as a result of recreational activities and DPW activities.	USARAK Natural Resources	High	x	x	x	x	x

Other Management Alternatives Considered and Eliminated: There are other potential methods for protecting and managing wetlands. Total exclusion of all uses, however, from wetlands is not plausible. Military training must occur in all habitats. On the other hand, no limitations on the use of wetlands could permanently damage the ecosystem. The proposed management actions listed above carefully balance the needs of the military mission, recreation, and the ecosystem. Other actions would be too minimal or would be cost-prohibitive.

5.1.5 Wetlands Management Responsibilities

Range Control, a component of the Directorate of Plans, Training, Security and Mobilization (DPTSM), is the primary authority for regulating military land-use and the various stipulations of Army land-use permits. Range Control's authority to schedule training facilities and conduct range inspections initiates from the Installation Commander and is explained in the USARAK Range Regulation 350-2, which details acceptable conduct during training exercises in the field to reduce negative environmental impacts.

USACE is the authority for insuring compliance with the requirements of Section 404 of the Clean Water Act, which regulates use of wetland areas. USACE will conduct follow-up inspections of wetland areas to insure compliance with wetlands permits as issued.

5.2 Forest Management

Forest management is required to protect, maintain, and enhance the forested environments on Fort Richardson for military training. Tree density, ground cover, and forest understory are critical terrain features to challenge soldiers in military maneuvers. In addition, management of the forest ecosystem is important to maintain biodiversity, manage habitats for wildlife, and for the development of outdoor recreation opportunities.

5.2.1 Forestry Program Goals

Forestry goals all contribute to one or more of the overall natural resources program goals of stewardship, military training support, compliance, quality of life, and integration. The forestry goals for Fort Richardson are:

- Manage vegetation and timber in support ecosystem management objectives.
- Manage vegetation and timber in support of military range upgrade projects.
- Manage vegetation and timber to enhance recreational opportunities.

The steps needed to meet the forestry program goals are:

- Maintain an current inventory of forest and vegetation resources.
- Conduct forestry planning.
- Implement forest management practices through timber stand improvement, timber management, timber sales, and timber salvage cuts.
- Control forest pests.
- Provide firewood for the local military and civilian population.
- Conduct commercial timber sales only as a tool meet the above goals.

5.2.2 Forest Management Plan

Forest management planning includes all the planning, budgeting, contract oversight, and organization necessary to implement the forestry program. The primary emphasis for this component of the forestry program is the preparation and update of the forest management action plan.

Description and Justification: Prepare, update, and implement a forest management action plan for Fort Richardson. The forest management action plan will consider public safety, preservation of habitat, and recreation. Harvests of timber products from Fort Richardson are permitted, but not mandatory. Management of the forest ecosystem is one of the most critical aspects of land management on the

installation due to the high percentage of forested land and its importance to wildlife. Updates of the forest management plan are required by Public Law 86-797 (Sikes Act) every five years to implement the INRMP. Per Memorandum DAIM-ED-N, 21 March 1997, this component of the INRMP is a class 1 requirement.

Measures of Effectiveness:

- Complete, update, and maintain a forest management action plan for Fort Richardson.
- Maintain and enhance the health and productivity of forest and woodland ecosystems.
- Maintain a diverse forest to enhance a varied military training environment.
- Involve resource agencies in the planning process for forest management, and the public in review of the plan.

Management History: The first forest management action plan for Fort Richardson was completed in 2001.

Current Management: Current management actions to update the forest management action plan will cease in 2002. If this INRMP is not approved and funded, no new forest management plan will be prepared, updated, or implemented. Policies already in place in the current forest management plan will continue.

Proposed Management: Prepare and update the forest management action plan as outlined in Table 5-7.

Table 5-7. Forest Management Action Plan.

OBJECTIVE	RESPONSIBLE FOR IMPLEMENTATION	PRIORITY	IMPLEMENTATION				
			2002	2003	2004	2005	2006
Prepare annual updates of the forest management action plan.	USARAK Natural Resources	High	x	x	x	x	x
Prepare and update forest management action plan for the planning period of 2007-2011.	USARAK Natural Resources	High					x
Complete NEPA documentation for update	USARAK Natural Resources	High					x

Other Management Alternatives Considered and Eliminated: There are no alternatives to maintaining a current forest management action plan with updates at least every five years. NEPA documentation is also legally mandated.

5.2.3 Forest Inventory

Description and Justification: Forest inventory involves the identification of species, size class, and density of forest trees. USARAK utilizes the ecological land classification for Fort Richardson as the basis for identifying stand locations throughout the installation. Within ecological land classification units known as ecosites, stands are delineated through a combination of field surveys, air photo interpretation, and GIS. Stands are sampled to determine tree species composition, size class distribution, canopy cover, stem density, basal area, regeneration composition and density, and merchantable volumes by species. This information is essential for effective management of forest resources. Recent requests from the

public indicate the need to conduct forest inventories on Fort Richardson to determine if there are sufficient resources to support a commercial forest program. The Sikes Act requires those withdrawn lands, such as at Fort Richardson, be included in INRMP planning and program implementation, including forest management. Conducting a forest inventory is required by Public Law 86-797 (Sikes Act) to implement the INRMP.

Measures of Effectiveness:

- Maintain current and accurate spatial and tabular data on the forest resources on Fort Richardson.

Management History: The only inventory of forest resources on Fort Richardson was conducted over 45 years ago, in 1955, and was not complete. As a result of a study conducted in 1995 (Marler and Vankat, 1997), Fort Richardson's old growth forests have been quantitatively identified, characterized, and mapped. These forests have unique aesthetic, commercial, and ecological values. USARAK is interested in preserving these old growth forests.

Current Management: USARAK utilizes a digital vegetation map for Fort Richardson as the basis for identifying tree species locations throughout the installation. Within vegetation types, forest stands are delineated through a combination of field surveys and air photo interpretation. Stands are sampled to determine tree species composition, size class distribution, canopy cover, stem density, basal area, regeneration composition and density, and merchantable volumes by species. This information is essential for effective management of forest resources.

Continuous forest inventory plots (CFI) are also located throughout the forested areas of Fort Richardson training lands. These permanent plots are an effective method for detecting changes in forest health, composition, structure, forest fire fuel loading, and determining growth and mortality which can be applied in growth projection models. Periodic measurement of permanent sample plots is statistically superior to successive independent inventories for evaluation of changes in forest conditions. Permanent plot locations and intensity will be systematically stratified by forest type across the landscape.

Proposed Management: Conduct a forest inventory for Fort Richardson as outlined in Table 5-8.

Table 5-8. Forest Inventory.

OBJECTIVE	RESPONSIBLE FOR IMPLEMENTATION	PRIORITY	IMPLEMENTATION				
			2002	2003	2004	2005	2006
Conduct forest inventory on 10% of Fort Richardson lands per year that may have viable commercial forest value.	USARAK ITAM	Medium	x	x	x	x	x
Conduct continuous forest inventory plot monitoring on 100 CFI plots per year.	USARAK ITAM	Medium	x	x	x	x	x
Prepare annual forestry report.	USARAK ITAM	Medium	x	x	x	x	x

Other Management Alternatives Considered and Eliminated: There are other potential methods of conducting a forest inventory. The proposed methods for conducting the forest inventory on Fort Richardson, however, were developed specifically for the boreal forests.

5.2.4 Forest Management

Description and Justification: Timber, fuelwood, or Christmas tree sales will be used to accomplish military and/or ecosystem management objectives. Timber stand improvement, timber management, timber sales, and timber salvage cuts may be utilized as a tool to accomplish habitat improvement or to improve the commercial value of forest tree species. A reduction in forest density in some areas is necessary to support military training and also serves as habitat management for wildlife that prefer successional stages of forest vegetation. Conducting forest management is required by Public Law 106-65 (Military Land Withdrawal Act) as mitigation for the land withdrawal LEIS, and Public Law 86-797 (Sikes Act) to implement the INRMP.

Measures of Effectiveness: Meeting military mission requirements will remain the primary objective of forest management during 2002-2006. Future management of the forest ecosystem on Fort Richardson will:

- Support the military mission.
- Enhance wildlife habitat for some species.
- Sustain production of forest products.
- Provide quality recreational opportunities.
- Minimize restrictions to training from forest management policies and issues.

Forest Management Areas: Forest management areas are those areas where forest management actions may occur during 2002-2006. These management areas are described in Table 5-9 and are depicted in Figure 5-2.

Table 5-9. Forest Management Areas.

Management Areas	Priority	Size
Forest management areas	High priority for forest management	? acres
	Medium priority for forest management	? acres
	Low priority for forest management	? acres
Forest protection areas	No forest management	? acres
Non-forested areas		? acres

Management History: There have been no commercial forest sales on Fort Richardson because of a limited market. Also most of the forest is relatively young due to widespread forest fires in the early 1900s (Elmendorf AFB, 1994). Valley Sawmill is the closest market for Fort Richardson sawtimber. The market for sawtimber was limited, and the post has little of what is considered high quality. There was also no market for pulpwood, as the lack of bidders for the 1995 timber sale designed to clear land for the Malemute Drop Zone expansion project clearly indicated. This wood was appraised at \$30/MBF and \$25/cord. No response was obtained during the first attempt to sell the timber even though over 20 potential bidders were contacted.

Fort Richardson's forestry program has emphasized support of the military's mission, enhancement of habitat diversity in the forest ecosystem, protection of forest watersheds, and management of wildlife habitat. It has also promoted outdoor-recreation opportunities and produced some personal-use forest products.

From 1996–1997, approximately 70 acres of mature forest were cut for expansion of the Malemute Drop Zone (DZ). Free permits were given to the public for personal-use of the timber and fuelwood to expedite the clearing. The ultimate goal is to clear approximately 300 acres of mature forest for expansion of the Malemute DZ to a suitable size to accommodate current and future military training operations.

As a result of the recent spruce bark beetle infestation in southcentral Alaska, there are many acres (undetermined) where dead or dying white spruce are common on Fort Richardson. A White Spruce Protection Project proposal for the cantonment area on Fort Richardson was funded by the USFS in 1999. A thorough inventory was made of all large surviving white spruce trees in and around the cantonment area. The inventory was followed by treatments for the protection of the remaining trees.

Current Management: Forest management does not just involve commodity production; protection of sensitive habitats and needs of the military for cover and concealment are also primary objectives. It is important to maintain a wide variety of ages and species of trees, protect old growth forests, protect watersheds, and protect options for future management. The components of forest management on Fort Richardson include timber removal for military mission support, timber stand improvement, forest regeneration, timber management, timber sales, and forest disease/insect prevention.

Conduct Timber Removal for Military Mission Support: The military needs to train personnel under certain environmental conditions. This may require the removal of trees to create open areas for drop zones, small arms firing ranges, or construction. Thinning stands of trees to allow maneuverability in certain areas may also be necessary.

USARAK natural resources personnel have two choices when there is a need to clear or thin timber with commercial value on withdrawn lands. They can request support from BLM to conduct a timber sale, or they can remove the trees (by cutting or burning) without selling them, pending approval from BLM and after NEPA analysis. Troops are permitted to harvest some forest products to achieve training objectives. For example, trees less than four inches dbh may be cut without prior approval, but removal of larger trees requires Natural Resources Branch approval. Remaining stumps must be less than six inches high. (US Army, Alaska, 1994).

Timber Stand Improvement: Timber Stand Improvement (TSI) is designed to improve species composition, quality, and/or growth rate of existing stands by removing competing vegetation to allow preferred trees to grow at faster rates. TSI is often categorized as activities used to improve the quality of commercial timber, but it may also be used to improve forest conditions for other uses. TSI may include thinning, chemical injection, prescribed burning, etc., all of which are designed to improve species composition, quality, and/or growth rate of existing stands by removing competing vegetation to allow preferred trees to grow faster.

Forest Regeneration: Regeneration of forests, either natural or planned, is an essential part of forest ecosystem development. Regeneration of forests can be made through planting seedlings, planting sprigs, coppice cuts or seeding.

Timber Management: Timber management involves managing vegetation and timber to meet ecosystem management objectives while maximizing the commercial value of the timber that must be cut to meet those objectives. Management of white spruce should be conducted on a 120-year rotation, and aspen saw timber should be conducted on a 60-year rotation. Black spruce is not suitable for commercial management. Timber should be harvested using selective harvest (taking out certain diameters on a given cut) and improving species composition at the same time using species-specific harvest. The preferred method is to cut older white spruce first (about 25 trees per acre to a 70-80% BA) as well as culls and

undesirables, leaving aspen, cottonwood, and birch. This resulting mixed forest grows better than white spruce monocultures. Selective cutting also reduces *Calamagrostis* infestation of cut sites.

Timber Sales: The removal and/or thinning of timber on portions of Fort Richardson could improve conditions for conduct of the military mission and enhance the local economy. The Fort Richardson Resource Management Plan (BLM and US Army, 1994) requires that timber sales on Fort Richardson be governed by common BLM timber management practices, contract stipulations, and the mandates of the state's forest practices regulations. Common requirements include:

- Construction, improvement, and maintenance of safe and environmentally-sound road systems.
- Felling and yarding of timber in such a way as to protect soil and water quality, residual trees, and human safety.
- Treatment of logged sites to prepare them for the next generation of trees.
- Disposal of logging slash for silvicultural and/or fire hazard reduction purposes.
- Mitigation measures for protecting wildlife habitat.
- Other miscellaneous provisions, where appropriate, such as meeting minimum fire requirements and application of disease control measures.

Harvest plans would be prepared prior to commercial sales of forest products. Plans would include sale boundaries, cruised volume, silvicultural prescription, road layout, best management practices for prevention of soil erosion and sedimentation, water quality considerations, cultural resources protection, wildlife considerations, harvest method(s), scaling requirements, slash disposal, site preparation, and regeneration requirements. A USARAK wildlife biologist would assist with plans for timber sales to ensure consideration of wildlife habitat values. Documentation for compliance with NEPA as well as required cultural resources surveys would be completed prior to sales.

Forest Disease/Insect Prevention: The primary forest insect problem on Fort Richardson is the spruce bark beetle (*Dendroctonus rufipennis* [Kirby]). This forest pest has been active throughout southcentral Alaska for over 25 years and especially in the Anchorage vicinity since the early 1990s.

The spruce bark beetle prefers white spruce trees that are greater than six inches in diameter; black spruce is rarely attacked. Mature forests are most susceptible. Outbreaks generally last four to five years and then collapse. The spruce bark beetle sometimes kills virtually all trees in older, dense stands, which makes natural regeneration of white spruce more difficult due to the resulting lack of seed sources. White spruce only produces good seed crops about once every five years. The spruce bark beetle larvae live between the bark and wood, and when mature, the beetles emerge from infested trees and fly to new trees in mid-May to mid-June. Beetles prefer to fly to downed trees (Holsten et al., undated).

White spruce seed germination requires disturbance of mineral soils. Under natural conditions these disturbances are associated with glaciation, fire, flooding, etc., but human activities, in particular fire suppression, have reduced these regimes. The spruce beetle outbreak in southcentral Alaska is symptomatic of stagnating forest ecosystems. The combination of mature spruce and a reduction in natural disturbance is ideal for the spruce bark beetle (Dr. Edward Holsten, pers. com., 1995).

Spruce bark beetle infestations may result in invasions by species such as bluejoint grass, a native, perennial, invasive species. When a closed spruce canopy is reduced by 40 percent or more, conditions are good for bluejoint grass invasion (but see below). This is especially true if there is inadequate scarification to promote good seedbeds. Logging during winter often fosters prime conditions for bluejoint grass due to little soil disruption of frozen grounds (Dr. Edward Holsten, pers. com., 1995).

Major insect outbreaks may cause changes in habitat for many wildlife species, such as songbirds and raptors. Those species that prefer older, more mature forests will experience a decline in habitat quality while those preferring younger successional stages (or dead timber) will benefit from these changes. The best prevention tactic to reduce spruce bark beetle damage is to manage for a diversity of species and age classes within the forest. Thinning of the canopy by a least 40 percent may help by warming the soil and reducing competition; bluejoint grass favors lowered soil temperatures while spruce and birch favor warmer soils (Dr. Edward Holsten, pers. com., 1995).

Several insect defoliators including the mourning cloak butterfly (*Nymphalis antiopa*), spear-marked black moth (*Rheumaptera hastata*), large aspen tortrix (*Choristoneura conflicana*) and the spruce budworm (*Choristoneura* spp.), periodically cause some loss of growth in isolated stands. These outbreaks have been very limited and cause relatively little damage. Large-scale control is neither needed nor feasible.

Some trees are infected with a fungus called heart rot. It is especially prevalent in birch stands over 80 years of age (Elmendorf AFB, 1994). Heart rot is best managed by maintaining relatively young stands, but this is incompatible with the noncommercial objectives of forest management on Fort Richardson. The ecological role of older trees with heart rot outweighs the advantages of maintaining younger stands, especially considering the scarcity of older stands on the post. There are no other serious forest pests or diseases known to occur on Fort Richardson.

Proposed Management: Conduct forest management on Fort Richardson as outlined in Table 5-10.

Table 5-10. Forest Management Projects.

OBJECTIVE	RESPONSIBLE FOR IMPLEMENTATION	PRIORITY	IMPLEMENTATION				
			2002	2003	2004	2005	2006
Conduct timber management on Fort Richardson North and South Post.	USARAK Natural Resources	High	x	x	x	x	x
USARAK will remove or thin up to 400 acres of trees or shrubs per year to support military training activities.	USARAK Natural Resources	High	x	x	x	x	x
Conduct timber stand improvement on a maximum of 100 acres per year of timber stand improvement.	USARAK Natural Resources	High	x	x	x	x	x
Conduct salvage cuts on up to 400 acres per year.	USARAK Natural Resources	High	x	x	x	x	x
Conduct forest pest protection on up to 200 acres per year.	USARAK Natural Resources	High	x	x	x	x	x
Provide fuelwood and Christmas trees to military and public annually.	USARAK Natural Resources	High	x	x	x	x	x
Conduct timber sales and cut up to a maximum of 20,000 board feet per year.	USARAK Natural Resources	High	x	x	x	x	x

Other Management Alternatives Considered and Eliminated: There are other potential methods for managing forests. No other options, however, would meet the needs of the military mission. The proposed management actions listed above carefully balance the needs of the military mission, recreation, and the ecosystem. Other actions would be too minimal or would be cost-prohibitive.

5.2.5 Forestry Responsibilities

BLM retains vegetation rights for all withdrawn lands on Fort Richardson except for several small parcels. Any vegetation manipulation by USARAK on lands where BLM retains vegetation rights must be approved by BLM. BLM timber management practices, contract stipulations, and the mandates of the State's forest practices regulations would govern the sale of timber from such areas.

Forestry will be completed in cooperation with BLM, which holds timber rights for most Fort Richardson lands. Forests on withdrawn lands fall under BLM's restricted category for management; that is, management of the area is primarily for military-use, but timber harvests are permitted. Members of the public may approach BLM for a permit to purchase timber on withdrawn lands, but each timber sale must be approved by the military.

Any timber removal and other forest management practices will be coordinated with Range Control to ensure minimal disruption of military training. Scheduling usually will be done three to six months in advance of activities. Appropriate NEPA documentation will be completed prior to implementation of timber stand improvement projects.

5.3 Fire Management

Wildfires are a concern at Fort Richardson, but rarely are they a significant problem. Severe drought conditions only occur about once every 20 years. In normal years, there is an average of less than five wildfires that are usually mission-related, small, and easily contained.

The Chugach Mountain slopes behind the Small Range Complex have a high potential for wildfires. Most fires started there are from tracer rounds and pyrotechnics fired from adjacent ranges when fire danger is high. Fires in this area can affect the already poor air quality of Anchorage and, if they escape, could burn north toward the community of Eagle River, southwest into Anchorage, or east into Chugach State Park. In addition, the recent spruce bark beetle outbreak, which has killed many of the mature white spruce trees in the area, has led to public perception that there is an increased potential for wildfires due to excessive fuel loading.

USARAK is aware of this situation and is currently working with BLM fire management personnel to develop more protective measures that will reduce the existing threat of wildfires and also allow increased use of the firing ranges for training purposes.

5.3.1 Fire Management Goals

Fire management goals all contribute to one or more of the overall natural resources program goals of stewardship, military training support, compliance, quality of life, and integration. The fire management goals for Fort Richardson are:

- Protect human structures and military training sites from fire, but not the land.
- Use prescribed burning to manage natural resources and reduce losses from catastrophic wildfire.

5.3.2 Fire Management Plan

Fire program management and planning includes all the planning, budgeting, contract oversight, and organization necessary to implement the fire management program. The primary emphasis for this component of the fire management program is the preparation and update of the fire management plan every five years.

Description and Justification: Write, update, and implement a fire management action plan for Fort Richardson. The fire management action plan provides the planning framework for all fire management decision-making, and specifies the uses of fire, which are consistent with and can enhance land management objectives. The plan would reduce forest fire hazard caused by incendiary type weapons and will enhance habitat as part of ecosystem management. Training is essential to the U.S. Army's mission of preparedness and military readiness. Fire management has become an increasing concern on training sites in recent years as the activities associated with training increases the risk of unplanned fire ignitions with the use of ammunition and pyrotechnics. This document provides guidance and direction to establish an effective fire management program and the eventual development of a fire management plan that fulfills interagency guidelines. This document identifies responsibilities and standard practices for fuels management, pre-suppression, prevention, and suppression while supporting military preparedness along with United States Department of the Interior, Bureau of Land Management (BLM) and United States Army Alaska (USARAK) resource management goals. Updates of the fire management action plan are required by the Memorandum of Understanding between BLM and USARAK concerning the Management of Certain Public Lands Withdrawn for Military Use and the Interdepartmental Support Agreements WC1SH3-95089-502 and 140138-95089-905 between USARAK and BLM and Public Law 86-797 (Sikes Act) every five years to implement the INRMP. Per Memorandum DAIM-ED-N, 21 March 1997, this component of the INRMP is a class 1 requirement.

Measures of Effectiveness:

- Complete, update, and maintain a fire management action plan.
- Establish fire management procedures and protocols to provide USARAK the capability to complete its mission to maintain combat readiness and fulfill resource management intent.
- Maintain and enhance the health, productivity and biological diversity of the ecosystem through fire suppression, fire prevention, and prescribed fire planning.
- Involve resource agencies in the planning process for fire management, and the public in review of the plan.

Management History: The first fire management action plan was completed in 2001.

Current Management: Current management actions to update the fire management action plan will cease in 2002. If this INRMP is not approved and funded, no new fire management action plan will be prepared, updated, or implemented. Policies already in place in the current fire management action plan will continue.

Proposed Management: Prepare and update the fire management action plan for Fort Richardson as outlined in Table 5-11.

Table 5-11. Fire Management Action Plan.

OBJECTIVE	RESPONSIBLE FOR IMPLEMENTATION	PRIORITY	IMPLEMENTATION
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			2002	2003	2004	2005	2006
Prepare annual updates of the fire management action plan.	USARAK Natural Resources	High	x	x	x	x	x
Prepare and update fire management action plan for the planning period of 2007-2011.	USARAK Natural Resources	High					x
Complete NEPA documentation for update	USARAK Natural Resources	High					x
Develop a, Interagency Fire Management Plan that adheres to guidelines outlined by the Interagency Wildland Fire Coordinating Group.	BLM Alaska Fire Service	High		x			
Develop pre-suppression plans for each of the area units of Fort Richardson: Cantonment Area, North Post and South Post.	BLM Alaska Fire Service	Medium		x			
Develop plans for proposed prescribed fires on Fort Richardson.	BLM Alaska Fire Service	Medium		x			
Develop plans and fuel treatment projects to reduce the threat of fires starting on military lands and impact areas and burning onto adjacent lands of high resource value.	BLM Alaska Fire Service	Medium		x			
Develop generic burn plan for various military directorates to use for grounds maintenance projects.	BLM Alaska Fire Service	Medium		x			

Other Management Alternatives Considered and Eliminated: There are no alternatives to maintaining a current fire management action plan with updates at least every five years. NEPA documentation is also legally mandated.

5.3.3 Fire and Fuels Inventory

Description and Justification: Fire and fuels inventory includes the inventory of forest fuel hazards, the delineation of areas in need of fire suppression, as well as the mapping of past fires. This information is useful for managing and decision-making during fire events. Past fire history also is an important input into habitat management decision-making. Conducting fire and fuels inventory is required by Public Law 86-797 (Sikes Act) to implement the INRMP.

Measures of Effectiveness:

- Maintain a complete history of fires on Fort Richardson.
- Identify and quantify potential forest fuel hazards on Fort Richardson.

- Map all areas that contain features needing fire suppression.

Management Areas: Fire history on Fort Richardson is shown in Figure 5-3.

Management History: In 1999, a fire fuel hazard map was created for Fort Richardson. Fire surveillance activities have been ongoing since Fort Richardson was created in the 1950s.

Current Management: Fire surveillance activities remain an integral part of range operations and the fire department.

Proposed Management: Continue the the fire and fuels inventory program as outlined in Table 5-12.

Table 5-12. Fire and Fuels Inventory.

OBJECTIVE	RESPONSIBLE FOR IMPLEMENTATION	PRIORITY	IMPLEMENTATION				
			2002	2003	2004	2005	2006
Collect fuel loading information as part of the forest inventory.	USARAK ITAM	Medium	x	x	x	x	x
Delineate and maintain GIS data layers showing historical fires on Fort Richardson.	USARAK ITAM	Medium	x	x	x	x	x
Map past areas where ordnance has been used and develop pre-suppression plans on how to deal with wildland fire suppression in these areas.	USARAK ITAM	Medium	x	x	x	x	x
Map all known cultural features on suppression maps and develop fire management recommendations for these features.	USARAK ITAM	Medium		x			
Map all military structures on suppression maps. Assess fire suppression options and recommendations for these structures.	USARAK ITAM	Medium		x			
Map all known natural resource features and areas of concern from wildland fire suppression and management activities on suppression maps. Develop management strategies to avoid conflicts with these natural resource features and areas of concern.	USARAK ITAM	Medium			x		
Update fuels map of Fort Richardson.	USARAK ITAM	Medium			x		
Update fire history map of Fort Richardson.	USARAK ITAM	Medium	x	x	x	x	x

OBJECTIVE	RESPONSIBLE FOR IMPLEMENTATION	PRIORITY	IMPLEMENTATION				
			2002	2003	2004	2005	2006
Research causes of fire ignitions on Fort Richardson to identify areas of high fire occurrence	USARAK ITAM	Medium				x	
Map all known non-sensitive structures on Fort Richardson.	USARAK ITAM	Medium				x	
Update fire maps with military special use areas and fire management options for these areas.	USARAK ITAM	Medium	x				
Research weather patterns influencing fire behavior and historical weather analysis for each land unit of Fort Richardson.	USARAK ITAM	Medium	x				

Other Management Alternatives Considered and Eliminated: There are other potential methods of conducting a fire and fuels inventory. The proposed methods for conducting the fire and fuels inventory, however, were developed specifically for boreal forest areas in Alaska.

5.3.4 Fire Management

Description and Justification: The components of fire management include both prevention and suppression. Benefits of fire suppression and fire prevention to military training include reduced fuel load, an increased number of days that a facility is available during high fire season, reduced fire fighting costs, and protection of range facilities. Benefits to the environment are considerable, particularly in areas that have not burned in recent years. Fire management is required to protect, maintain, and enhance military training environments. In addition, management of the boreal forest ecosystem is important to maintain biodiversity, wildlife habitat, and the development of outdoor recreation. The management of fire on the landscape is consistent with ecosystem management principles. Conducting fire management is required by Public Law 106-65 (Military Land Withdrawal Act) as mitigation for the land withdrawal LEIS, and by Public Law 86-797 (Sikes Act) to implement the INRMP.

Measures of Effectiveness:

- Protect structures and man-made facilities.
- Reduce the ability of potential fires to spread outside Fort Richardson.
- Reduce forest fuel hazard through prescribed burning.
- Reduce the escapement of wildland fire from impact areas through prescribed fires and mechanical treatments along the boundaries of impact areas.

Management Areas: Fire suppression priorities are grouped into four categories: Critical, Full, Modified, and Limited. Summaries of each category (from Anonymous, 1982) are presented below. Fire protection categories for north and south post on Fort Richardson are Full. Fire management categories by area on Fort Richardson are shown in Figure 5-4.

Critical Management Option: Areas receive maximum detection coverage and are highest priorities for attack response. Immediate and aggressive initial attack is provided. Land owners/managers are notified

of the situation as soon as possible. Critical management areas receive priority over adjacent lands and resources in the event of escaped fires.

Full Management Option: Areas receive maximum detection coverage and receive immediate and aggressive initial attack responses. If the initial attack response is successful or the fire is otherwise controlled within the first burning period, special agency notification is not required. When fires escape initial attack and require additional suppression, affected land owners/managers are notified to develop further fire strategy.

Modified Management Option: This option provides a management level between Full and Limited. The intent is to provide a relatively high degree of protection during periods of increased fire danger, but a lower level of protection when risks of fires are diminished. Modified areas receive maximum detection coverage. Initial attack action, or non-action, is based on a standardized evaluation date determined by the Alaska Interagency Wildland Fire Coordination Group. Unmanned fires are monitored.

Limited Management Option: This option recognizes areas where natural fire is important or the values at risk do not warrant the expense of suppression. Limited management areas receive routine detection effort. Attack response is based on needs to keep the fire within Limited management areas and to protect individual Critical management sites within Limited management areas. Land owners/managers are immediately notified of fires detected. Unmanned fires are monitored.

There are two other special categories on Army lands in Alaska. Unplanned areas are those lands that the land manager/owner has opted out of the Alaska Interagency Wildland Fire Management Plan. These lands are usually treated as Full. For suppression direction the Land Manager needs to be contacted. Restricted or Hot Zone is a category used for impact areas and other places where no on-the-ground fire fighting occurs. Fires can still be suppressed in Restricted Areas, but suppression is through back burning or aerial-dropped retardant.

Management History: Fire suppression has traditionally been confined to areas behind the small arms complex. Because of the extensive mortality of white spruce in the area, fire prevention activities were conducted in 1999 and 2000 to reduce fire fuels immediately behind the small arms ranges.

Current Management:

Determining Fire Danger: The Fire Danger Rating (FDR) is used on Fort Richardson to reduce the risk of wildfire. The Fort Richardson Fire Department monitors fire danger parameters; when certain levels of risk are reached, restrictions on military activities are imposed. The Fire Department collects weather readings during fire season. Data are used to calculate the FDR using the Canadian Forest Fire Danger Rating System, which is an indication of wildfire danger. The FDR is provided to Range Control, which restricts the use of munitions and pyrotechnics as fire danger increases. Open burning requires a permit, except small warming fires do not require a permit (Army Environmental Handbook, 2000). All fires may be prohibited during extreme fire danger conditions.

The 1998 USARAK Range Policy categorizes fire danger into four broad headings, low, moderate, high and extreme. When equating the Canadian Forest Fire Danger Rating System (CFFDRS) fire categories with the categories in this broad rating scheme there will always be a certain amount of subjectivity involved, as no single (USARAK) category gives a complete picture of the fire danger. A thorough understanding of CFFDRS is necessary for the fire manager to make accurate determinations. The following table should assist in making those determinations.

CFFDRS Category	USARAK Category			
	LOW	MODERATE	HIGH	EXTREME
FFMC	<77	77-86	86-94	>94
DMC	<70	70-80	80-90	>90
DC	<150	150-300	300-400	>400
ISI	<2	2-5	5-10	>10
BUI	<60	60-70	70-80	>80
FWI	<3	3-12	12-22	>22

Note that the table above presents only guidelines and an informed determination will take interpretation. For example, DC may be extreme while FFMC is low and DMC is moderate. It would be logical in this case to place the fire danger at moderate, if the weather trend is toward warm and dry, because FFMC will change quickly to moderate and perhaps even high.

Wildfire Prevention: There are three components of wildfire prevention on Fort Richardson. The first component is to reduce the likelihood of starting a fire by limiting activities as imposed by the fire danger rating system. Reducing fuel hazard through mechanical removal and prescribed burning is the second component, and constructing or maintaining fire or fuel wood breaks is the third component.

Both prescribed burning and mechanical removal of vegetation can be used to accomplish fuel hazard reduction, which in turn, makes wildfires less likely to start and easier to control. Burning often opens areas to additional military training options, particularly maneuvers that are hampered by dense cover.

The prescribed burning “window” is very narrow, particularly during spring between loss of snow cover and green-up, usually occurring in May. Often this period is very wet, which makes burning difficult. It is often easier to get good burning conditions in fall, but there is debate over the relative value of fall burning. In addition, winds must be such that they do not blow smoke into urban areas, which further narrows the window. It is difficult to plan prescribed burning due to weather, military training, and availability of resources. An air permit from the Alaska Department of Environmental Conservation is required for any burning, as well as NEPA documentation.

Individual prescribed burns will have plans and appropriate NEPA documentation prepared after coordination between the BLM/NFO, the Natural Resources Branch, and the Fort Richardson Fire Department. AFS may be used to prepare plans for USARAK. Burn plans are used to evaluate and minimize risks associated with prescribed burning and will include how the fire will be set.

Cutting lanes specifically for fire control occurs only minimally at Fort Richardson. Major highways, waterways, wet areas, and smaller roads act as firebreaks on much of the installation. The likelihood of a fire crossing these obstructions is not cost effective enough to create and maintain firebreaks.

Wildfire Suppression: Wildfire suppression is an emergency operation and takes precedence over all other operations with exception of safeguarding human life. Initial attack operations for fires started on all critical, full, and modified (before conversion to limited) lands is provided by the USARAK Fire Department. Wildfire suppression is accomplished by the BLM Alaska Fire Service through the Alaska DNR Division of Forestry. USARAK contributes to fire detection and is available to help as needed. Fire

suppression priorities are grouped into four categories: Critical, Full, Modified, and Limited, as described above.

Prescribed Burning: Prescribed burning is a method of replacing ecosystem functions without the danger and loss of an uncontrolled wildfire. Wildfires probably had a more important influence on ecosystem functions during presettlement times. Even then, except during drought periods, fires were still relatively small and localized due to the weather and climate in the Anchorage area. With settlement came fire suppression and road systems (firebreaks) that further reduced natural fire frequency at Fort Richardson. Today, the absence of wildfires may be inhibiting the potential for optimal ecosystem development. The current infestation of spruce bark beetles in old-aged timber is one problem that may have been exacerbated by a lack of wildfires.

Proposed Management: Conduct fire management on Fort Richardson as outlined in Table 5-13.

Table 5-13. Fire Management Projects.

OBJECTIVE	RESPONSIBLE FOR IMPLEMENTATION	PRIORITY	IMPLEMENTATION				
			2002	2003	2004	2005	2006
Conduct fire suppression activities as necessary.	BLM Alaska Fire Service (ADNR – Division of Forestry)	High	x	x	x	x	x
Identify and assess fuel management strategies for urban/wildland interface areas.	USARAK Natural Resources	High	x	x	x	x	x
Implement Firewise program for private landowners adjacent to military lands.	USARAK Natural Resources	High	x	x	x	x	x
Break up large continuous fuels in areas requiring fire suppression status.	USARAK Natural Resources	High	x	x	x	x	x
Develop more effective means of calculating fire weather indices for localized training areas and implement a program of relaying fire danger ratings to training units.	USARAK Natural Resources	High	x	x	x	x	x
Develop a program of providing assistance to military units during periods of high fire danger.	USARAK Natural Resources	High	x	x	x	x	x
Develop and disseminate procedures for detection and reporting of fires.	USARAK Natural Resources	High	x	x	x	x	x

OBJECTIVE	RESPONSIBLE FOR IMPLEMENTATION	PRIORITY	IMPLEMENTATION				
			2002	2003	2004	2005	2006
Develop standard operation procedures for each training site on Fort Richardson to assist firefighters and incident commanders in establishing priorities, making decisions, dealing with ordnance issues, etc.	USARAK Natural Resources	High	x	x	x	x	x
Develop GIS system for military fire management office and for use on incidents with current data, maps, photos, suppression options, and restrictions.	USARAK Natural Resources	High	x	x	x	x	x
Identify and use fuel reduction treatments to reduce the threat of wildland fire at the urban/wildland interface, military structures, selected training areas, and cultural resources.	USARAK Natural Resources	High	x	x	x	x	x

Other Management Alternatives Considered and Eliminated: There are other potential methods for conducting fire management. No other options, however, would meet the needs of the military mission. The proposed management actions listed above carefully balance the needs of the military mission, recreation, and the ecosystem. Other actions would be too minimal or would be cost-prohibitive.

5.3.5 Fire Management Responsibilities

The Fort Richardson Fire Department maintains the responsibility for first response for wildfire suppression. Due to the small size of most fires, this response is generally adequate. The Fort Richardson Fire Department monitors fire danger parameters. When certain levels of risk are reached, restrictions on military activities are imposed. The Fire Department collects weather readings during fire season. Data are used to calculate Fine Fuel Moisture Content (FFMC), which is an indication of wildfire danger. The FFMC is provided to Range Control, which restricts types of munitions and pyrotechnics allowed as fire danger increases.

The BLM reimburses the Alaska Division of Forestry (DOF) for wildfire suppression in the southern half of the state. Such support has been requested only twice in the past four years.

The DOF also provides training for wildfire suppression to Fort Richardson personnel. There is a mutual aid agreement with regard to fire suppression between USARAK and Elmendorf AFB (Elmendorf AFB, 1994).

5.4 Fish and Wildlife Management

Fish and wildlife management on Fort Richardson has a history of traditional game management to support hunting, trapping, and fishing. In the early 1980s this base broadened, driven by a growing

recognition of the importance of non-game species in ecosystem functions. In the mid-1990s, broad-scale fauna and flora inventories were initiated with the goal implementing a more ecosystem-based approach to natural resources management. These inventories will continue, and formal long-term monitoring programs will also be initiated as the ecosystem approach to management expands. The natural resources staff at Fort Richardson looks forward to the challenge of developing and implementing a landscape scale ecosystem management program while at the same time maintaining high quality game habitat on Fort Richardson, and of course, continuing to promote the use of the land for military training.

5.4.1 Fish and Wildlife Management Goals

Fish and wildlife management goals all contribute to one or more of the overall natural resources program goals of stewardship, military training support, compliance, quality of life, and integration. The fish and wildlife management goals for Fort Richardson are:

- Improve the quality of habitat for game and non-game species.
- Monitor selected mammal and bird populations for long-term trends.
- Use artificial nesting structures to improve productivity for wildlife species.
- Produce game on a sustainable basis to support hunting and fishing programs.

5.4.2 Habitat Management Plan

Fish and wildlife program management and planning includes all the planning, budgeting, contract oversight, and organization necessary to implement the fish and wildlife management program. The primary emphasis for this component of the fish and wildlife management program is to prepare and update the habitat management action plan.

Description and Justification: Prepare, update, and implement a habitat management action plan for Fort Richardson. The plan will describe projects to improve habitat for moose, upland game birds, some furbearers and small mammals, some migrant landbirds, and soldiers. The habitat management plan will maintain habitat for several game species, maintain a diverse training environment, enhance recreational opportunities, and comply with the Sikes Act, Migratory Bird Treaty Act, Executive Order 12962, Recreational Fishery Resources Conservation Plan, Endangered Species Act, and AR 200-3. Updates of the habitat management plan are required by Public Law 86-797 (Sikes Act) every five years to implement the INRMP. Per Memorandum DAIM-ED-N, 21 March 1997, this component of the INRMP is a class 1 requirement.

Measures of Effectiveness:

- Complete, update, and maintain a habitat management action plan.
- Enhance wildlife, recreation, and military habitat on Fort Richardson.
- Involve the resource agencies in the planning process for habitat enhancement, and the public in review of the plan.

Management History: The first habitat management action plan for Fort Richardson was completed in 2001.

Current Management: Current management actions to update the habitat management plan will cease in 2002. If this INRMP is not approved and funded, no new habitat management plan will be prepared, updated, or implemented. Policies already in place in the current habitat management plan will continue.

Proposed Management: Prepare and update the habitat management action plan for Fort Richardson as outlined in Table 5-14.

Table 5-14. Habitat Management Action Plan.

OBJECTIVE	RESPONSIBLE FOR IMPLEMENTATION	PRIORITY	IMPLEMENTATION				
			2002	2003	2004	2005	2006
Prepare annual updates of the habitat management action plan.	USARAK Natural Resources	High	x	x	x	x	x
Prepare and update habitat management action plan for the planning period of 2007-2011.	USARAK Natural Resources	High					x
Complete NEPA documentation for update.	USARAK Natural Resources	High					x

Other Management Alternatives Considered and Eliminated: There are no alternatives to maintaining a current habitat management action plan in terms of updates at least every five years. NEPA documentation is also legally mandated.

5.4.3 Fish and Wildlife Inventory and Monitoring

5.4.3.1 Fish and Wildlife Monitoring

Fish and wildlife monitoring involves the continuation of existing programs and the creation of new long-term monitoring programs for birds, fish, and small mammals on Fort Richardson. These surveys focus on neotropical migratory birds, waterbirds, raptors, salmon, trout, and other fish species, frogs, small mammals, furbearers, and large mammal species. These monitoring programs are a major component of the ecosystem management program (see Chapter 3). Raptors are important predators in the ecosystem and many are vulnerable to human impacts. Fish are important in the ecosystem as both predators and prey, and are also important to scavengers, decomposers, and as a source of nutrients in freshwater systems. Small mammals play important ecological roles as secondary consumers, and as prey for a variety of predators. There is considerable concern in North America over declining populations of many neotropical migratory birds, and population trend data are required to manage and protect these declining species, as mandated by the Sikes Act and AR 200-3.

Description and Justification: Fish and wildlife monitoring on Fort Richardson entails monitoring ecologically important and sensitive species including fish, frogs, moose, bears, Dall's Sheep, furbearers, small mammals, raptors, waterbirds, and neotropical migratory birds. Game and furbearer monitoring will emphasize moose, ruffed grouse, black and brown bears, lynx, and snowshoe hare. Moose are monitored to ensure harvest levels are optimal for both utilization and protection of the species. Ruffed grouse are monitored to determine habitat improvement needs and to monitor the success of habitat improvement practices. Monitoring data will be digitally stored in the USARAK GIS. Conducting fish and wildlife monitoring is required by Public Law 86-797 (Sikes Act) to implement the INRMP.

Measures of Effectiveness:

- Complete annual or bi-annual monitoring of fish and wildlife to support decision-making and management of the ecosystem at Fort Richardson.

- Continue existing monitoring programs to evaluate population trends.
- Initiate long-term monitoring programs for selected species not currently monitored.
- Conduct cost-sharing of monitoring, utilizing partnerships with ADF&G, USFWS, and BLM.

Management History:

Frogs: Amphibian population declines and reports of amphibian deformities worldwide over the past decade have raised concerns over the status of the wood frog (*Rana sylvatica*) in Alaska. To date, little work has been done to determine the current wood frog population in the southcentral region. An Alaska Pacific University graduate student and the Alaska Natural Heritage Program (AKNHP) have initiated a volunteer-based amphibian monitoring study to determine where the frogs live, their baseline populations, and the timeline for their breeding season. The USFWS has proposed a more in-depth mark/recapture study to be performed on Fort Richardson if funding and personnel become available.

Small Mammals: A small mammal survey was conducted in summer 1994. Protocols for this survey were established in the LCTA Manual. The survey was not intensive enough to include all important habitats, but did result in a Checklist of the Mammals of Fort Richardson, Alaska prepared by Cook and Seaton (1995).

Six species of bats are known to occur in Alaska, however, they are not found in abundance and are primarily limited to the southeast. The little brown bat (*Myotis lucifugus*), the most common and wide ranging bat in the state, is found on Fort Richardson. It prefers to roost in small colonies in abandoned buildings, mine tunnels, and caves, or may be found near a permanent source of water. Use of pesticides, disturbance and/or destruction of roosts, and loss of foraging habitat have resulted in a drastic decline of little brown bats in many areas. Nationwide, over half of all bat species are in trouble. Bats generally produce only one offspring per year, so recovery can be a lengthy process. Little is known about the little brown bat on Fort Richardson. University of Alaska, Anchorage graduate students have expressed an interest in conducting studies on Fort Richardson to determine current bat population and distribution, monitor population trends, identify day and night roosts, and map migration routes. Sources for funding these studies are being sought.

Furbearers: During 1995–1996, ADF&G conducted a furbearer study on Fort Richardson with an emphasis on coyotes and the relationships between predatory furbearers and snowshoe hares. In addition, they are currently involved in an ongoing black bear study with Elmendorf AFB and Fort Richardson. These studies are described in Sinnott (1995).

Harvest information on furbearers has been collected from Fort Richardson hunters through a system requiring either sign-out at the main gate or a mail-in of harvest data by the end of each year. At the time of sign-out, harvest information is recorded. Fish harvest is monitored through an ADF&G statewide harvest survey. Furbearer harvest data is not very useful due to the mail-in provision, which is often ignored or inaccurate. Beginning in 1998, hunters were required to physically return their checkout sheet to the Main Gate with harvest data recorded at the end of each hunting day.

Waterbirds: The ERF contamination issue resulted in a great increase in survey efforts, particularly for waterfowl, shorebirds, bald eagles and other avian species associated with ERF. Surveys of this important area on Fort Richardson will continue during 2002-2006, as required for monitoring and remediation efforts on ERF. Results will be recorded in memoranda and electronic databases.

In recent years, at least three other ground and aerial surveys for birds have been conducted beyond those described above. These surveys focused on lakes and wetlands to document waterfowl (especially

breeding pairs), shorebirds, ravens, raptors, and other species. These surveys will be continued through 2003.

The USFWS conducted the first systematic waterfowl surveys on Fort Richardson in 1996 and 1997 as part of a Legacy project. Lakes and ponds were surveyed for the presence of loons, grebes and other waterfowl during the spring migration. Results of this survey will be used to determine additional monitoring needs for water birds.

Raptors: A 1994 USFWS raptor inventory on Fort Richardson (Schempf, 1995) identified six different types of raptors: bald eagle, golden eagle, northern harrier, red-tailed hawk, Harlan's hawk (dark phase of red-tailed hawk), and sharp-shinned hawk. Although no goshawks were found during this inventory, they are known to inhabit the forested areas of the post. The 1998 vegetation map will be used to pinpoint likely habitat for goshawks and intensive ground surveys will be conducted in those locations.

The USFWS conducted the first intensive owl surveys on Fort Richardson in 1997 (Browne and Andres, 1998). Three species of owls were identified: great-horned, saw-whet and boreal. The boreal owl was the most common species with nine birds recorded. Seven great-horned and six saw-whet owls also were recorded.

Landbirds: USARAK used three techniques to monitor neotropical migrant and resident landbirds: LCTA plots, BBS, and MAPS. The survey descriptions have been taken from Roush and Andres (1994) and Andres (1995). Surveys were conducted by the USFWS, CEMML, and volunteers.

The standard of using 60 LCTA plots for breeding bird surveys was modified to 40 plots for use at Fort Richardson. In 1994, 20 of these plots were surveyed. In 1995, 35 plots were surveyed, and in 1996 and 1997, 39 plots were surveyed. All surveys were conducted by USFWS personnel with the bulk of the work being conducted in the month of June.

Two BBS routes were established in 1994, a 50-stop route on the north post and a 30-stop route on the south post, including the Arctic Valley area. Both routes were surveyed each year, from 1994 to 1997. The BBS routes have been surveyed by USFWS personnel and volunteers, and are always conducted between 10 through June 20.

MAPS is a long-term, nationwide study designed to quantify demographic patterns in migratory bird populations. This information will help USARAK determine its needs for a neotropical bird management plan. In 1994, two MAPS stations were established, one on the south post at Bunker Hill, and one on the north post along the northeastern shore of Otter Lake. The station at Bunker Hill was abandoned in 1995 due to vandalism, but the station at Otter Lake has been monitored each year since 1994. The final year of study will be 1998, satisfying the criteria of five consecutive years of data. At MAPS stations in Alaska, mist-netting and point counts are conducted during June and July to monitor productivity and survivorship in the local breeding bird populations.

Because the three projects outlined above are limited in their coverage of potential bird habitats on Fort Richardson, a specific bird checklist survey (atlas survey) was also being conducted. This atlas survey is designed to determine species distribution and abundance on a base-wide scale. In this survey, biologists systematically search the post for bird species throughout the months of June and July, following the methods of Andres (1995).

Moose: From the 1940s to the 1960s, the post was used extensively for mechanized troop training, resulting in disturbance to many areas. This promoted the growth of early successional species such as

birch, aspen, alder, and willow. These species provided excellent moose habitat over large areas and caused the moose population to substantially increase.

In the late 1960s, there was a decrease in mechanized ground-training activities. Extensive areas of moose habitat eventually reverted to tall brush and timber. Both the quantity and quality of moose browse began to decline. Remaining prime moose habitat was over-browsed, and the moose population declined after moderately severe winters in 1970–71, 1971–72, and 1974–75.

Active habitat management utilizing a Hydro-Ax™ to clear mature brush and promote regeneration of browse was initiated in 1975 when approximately 150 acres of brush was cleared, in the Davis and Small Arms Ranges. Although habitat work has continued on an annual basis since its initiation, little has been accomplished during some years due to manpower constraints and equipment breakdowns. Since 1975, over 1,500 acres have been cleared, benefitting wintering moose on Fort Richardson.

The moose population on Fort Richardson was relatively stable during the period from 1986 to 1994 (Quirk, 1996). This stability was due mainly to excellent summer feeding ranges, mild winters with light snowpack, and few predators in calving areas to affect productivity. Although winter habitat created by Hydro-Axing has generally helped to increase the food supply, in some areas it has been limited and in others, overbrowsed. A dramatic decline in the moose population occurred in the winter of 1994–1995 when a deep snowpack persisted for the longest duration in over 25 years in southcentral Alaska. Results from the November 1996 aerial moose survey indicated a 26 percent loss in the total number of moose on Fort Richardson since the previous survey in 1994.

The target population size for the Fort Richardson moose herd (including Elmendorf AFB and Ship Creek) has fluctuated over the years but is currently set at 500 animals. This is a reduction from years past and is based on concerns such as moose-auto collisions, conflicts with people and pets, loss of considerable acreage of former moose habitat to construction and development, declining productivity of the herd, and excessive pressure on remaining winter habitat on Fort Richardson. Declining productivity of the herd is indicated by a significant decrease in calf:cow ratios from 60 and 58 calves/100 cows in 1986 and 1987 to 28–38 calves/100 cows in all subsequent surveys beginning in 1988 (Table 8-3a). Although natural fluctuations occur in the environment, such large differences over several years of surveys are indicative of other confounding problems.

Surveys on Fort Richardson, Elmendorf AFB, and Ship Creek were initiated in the 1960s, but comprehensive written reports have been compiled only since the 1980s.

Typically, moose surveys were conducted in early winter (usually November) when snow cover is complete and light conditions are optimal. Surveys during past years were conducted from Army helicopters, later from helicopters flown by contracted pilots, and recently from two Super Cub fixed-wing aircraft flown by experienced commercial pilots under contract. One Super Cub carried a biologist/observer from USARAK and the other carried a biologist/observer from ADF&G.

Approximately 90,000 acres were surveyed annually, requiring about 18 hours of combined flying time. Data was collected from intensive aerial observations in 14 survey units on Fort Richardson, Elmendorf AFB, and the Ship Creek drainage in Chugach State Park. Data included the number of different-size bulls observed (small, medium, and large as determined by rack size), the number of cows, the number of cows with calves, and the number of lone calves.

Productivity, survivorship, and recruitment of moose populations was determined based on the number of calves per 100 cows. The November census data for healthy, productive moose herds in Alaska with normal mortality rates typically showed 20–40 calves per 100 cows. Herds with 40–60 calves per 100

cows not only indicated highly productive herds, but also low mortality rates during the first six months of the calves' lives (calving on Fort Richardson takes place within a short period of time during mid to late May). The Fort Richardson moose herd has shown relatively high numbers of calves per 100 cows in 1986 and 1987 (60 and 58 respectively) when there were no hunts, and substantially lower numbers during 1988 through 1993 (average of 35).

Relative herd size was determined by using a Sightability Correction Factor based on an Intensive Plot Computer Model provided by ADF&G, which corrected for unsighted animals. Bull/cow and calf/cow ratios were calculated, as were percentages of cows without calves, cows with a single calf, and cows with twins. Annual reports (Quirk, 1993, 1996 and B. Quirk, 1994) were prepared, and these data were used to establish harvest limits that USARAK and ADF&G personnel develop jointly. Data analysis followed procedures outlined in Gasaway et al. (1986).

During 1996 and 1997, a study was conducted to develop a diameter-mass relationship model to measure and predict utilization of willows by moose. The model was used to estimate utilization of the two most common willow species browsed by moose. These site specific estimates of browse utilization enabled USARAK biologists to identify discrete areas to be targeted for habitat rehabilitation. The application of the browse utilization model in the USARAK GIS in combination with other data layers (vegetation map, soils, topography) provided a powerful tool for the management of moose habitat and the planning of habitat improvement projects.

Current Management: Breeding Bird Surveys (BBS) and point-count stations are currently used to monitor landbird species. Waterbirds are monitored on ERF in association with the cleanup of white phosphorus from the area. Hunter check stations and hunter surveys are used to collect data on game species. Aerial surveys are used to monitor the moose population. Fish monitoring is conducted through angler success surveys.

Harvest information for fish is collected by ADF&G biologists through a statewide harvest survey. The survey, however, may not represent actual harvest, as youths less than 16 years of age are not included (Barry Stratton, pers. com.). Youths are thought to account for most of the angler effort in the Anchorage area.

Proposed Management: Conduct fish and wildlife monitoring as outlined in Table 5-15.

Table 5-15. Fish and Wildlife Monitoring.

OBJECTIVE	RESPONSIBLE FOR IMPLEMENTATION	PRIORITY	IMPLEMENTATION				
			2002	2003	2004	2005	2006
Conduct small mammal monitoring annually.	USARAK ITAM	High	x	x	x	x	x
Conduct furbearer monitoring annually.	USARAK ITAM	High	x	x	x	x	x
Conduct waterbird monitoring annually on ERF and other lakes on Fort Richardson.	USARAK ITAM	High	x	x	x	x	x
Conduct raptor monitoring annually.	USARAK ITAM	High	x	x	x	x	x
Conduct neotropical migrant and resident bird monitoring annually.	USARAK ITAM	High	x	x	x	x	x

OBJECTIVE	RESPONSIBLE FOR IMPLEMENTATION	PRIORITY	IMPLEMENTATION				
			2002	2003	2004	2005	2006
Conduct two BBS routes annually.	USARAK ITAM	High	x	x	x	x	x
Conduct grouse monitoring annually.	USARAK ITAM	High	x	x	x	x	x
USARAK will, in coordination with ADF&G, conduct a 1 to 2 year fish monitoring program of Fort Richardson lakes.	USARAK ITAM	High		x	x		
Conduct Wood Frog monitoring annually.	USARAK ITAM	High	x	x	x	x	x
Continue black bear data collection and monitoring.	USARAK ITAM	High	x	x	x	x	x
Conduct moose monitoring annually.	USARAK ITAM	High	x	x	x	x	x
Conduct Dall's Sheep monitoring annually.	USARAK ITAM	High	x	x	x	x	x

Other Management Alternatives Considered and Eliminated: There are other potential methods of conducting fish and wildlife monitoring. The proposed methods for conducting fish and wildlife monitoring, however, were developed specifically for use in south-central Alaska.

5.4.3.2 Planning-Level Fauna Surveys

Description and Justification: Conduct planning-level surveys for birds, fish, and mammals on Fort Richardson. These planning-level surveys focus on landbirds, waterbirds, and raptors, salmon, trout, and other fish species, and small mammals. These surveys each represent a ten-year update to determine trends in faunal diversity and improve the accuracy of the faunal database. Accurate planning-level fauna surveys are required by AR 200-3 and are required to implement this INRMP as mandated by Public Law 86-797 (Sikes Act). Per Memorandum DAIM-ED-N, 21 March 1997, these planning-level surveys are a class 1 requirement.

Measures of Effectiveness:

- Complete, maintain, and update the planning-level fauna surveys on Fort Richardson.
- Complete, maintain, and update the planning-level fauna surveys for threatened, endangered, or species-of-concern animals on Fort Richardson.
- Identify the requirement for planning-level fauna surveys in the EPR.
- Identify the requirement for planning-level fauna surveys for threatened and endangered species of animals in the EPR.

Management History: Planning-level fauna surveys were conducted on Fort Richardson in 1994-1995.

Current Management: There are currently no ongoing actions to update the planning-level fauna surveys.

Proposed Management: Conduct planning-level fauna surveys as outlined in Table 5-16.

Table 5-16. Planning-Level Fauna Surveys.

OBJECTIVE	RESPONSIBLE FOR IMPLEMENTATION	PRIORITY	IMPLEMENTATION				
			2002	2003	2004	2005	2006
Update the planning-level fauna surveys.	USARAK Natural Resources	High			x		

Other Management Alternatives Considered and Eliminated: There are no alternatives to maintaining a current planning-level fauna database. Per the Sikes Act, AR 200-3, and Memorandum DAIM-ED-N, 21 March 1997, this planning-level survey must be updated every ten years.

5.4.4 Fish and Wildlife Management

Fish and wildlife population management is accomplished through actions directly affecting fish and wildlife species. Setting population number goals and stocking game species are the primary actions used in population management. Habitat management, on the other hand, affects fish and wildlife populations indirectly by manipulating their habitat.

5.4.4.1 Fish and Wildlife Population Management

Description and Justification: Conduct fish and wildlife population management on Fort Richardson. Fish and wildlife management includes working with the ADF&G to set game harvest levels, stock fish in lakes, and control nuisance animals. It also involves conducting management of important and sensitive indicator species including furbearers, waterbirds, raptors, neotropical migratory and resident bird species, moose, grouse, Dall's sheep, wolf, and fish. Conducting fish and wildlife population management is required by Public Law 106-65 (Military Land Withdrawal Act) as mitigation for the land withdrawal LEIS, and by Public Law 86-797 (Sikes Act) to implement the INRMP.

Measures of Effectiveness:

- Maintain sustainable numbers of all fish and wildlife species on Fort Richardson.
- Maintain a herd of between 450 and 550 moose on Fort Richardson.
- Provide an adequate fishery on Fort Richardson through annual fish stocking.
- Maintain game population levels through hunting and fishing harvests.

Management Areas: Areas of emphasis areas on Fort Richardson for fisheries management are shown in Figure 5-5. ADF&G Game Management Units are shown in Figure 5-6.

Management History:

Fish Stocking: The total number of rainbow trout stocked in Fort Richardson's lakes annually from 1990–1997 ranged from 19,668 to 68,778. Included in these totals are an additional 1,000 trout that Otter Lake receives annually to support a kid's fishing derby. Chester Creek was stocked with between 4,606 and 7,700 rainbow trout per year for the period of 1990–1997.

For the period of 1990–1997, the annual stocking rates of landlocked salmon ranged from 9,000 to 28,000. The majority of landlocked salmon stocks are released in Clunie and Otter lakes. Stocking levels will remain at the current level for the next five years but may be adjusted to reflect current angler use trends or fish availability (Barry Stratton, pers. com.). Coho salmon smolt were released in Ship Creek at a rate of 54,764 to 225,000 annually over the period of 1990–1997.

A total of 11,750 arctic char were released in Clunie and Gwen lakes from 1990 through 1997. Additionally, in 1990, 500 arctic char were released in Thompson Lake. During 1998–2001, arctic char will only be stocked in Clunie Lake (Barry Stratton, personal communication).

Four thousand arctic grayling were released in Waldon Lake in 1993. At this time, there are no plans for releasing arctic graylings into Fort Richardson's lakes.

King salmon smolt were released in Ship Creek and Eagle River over the last five years. Eagle River has received between 102,100 and 121,066 per year. Ship Creek has received between 104,624 and 217,557 per year. ADF&G proposals are for Ship Creek stockings to remain at 210,000 for 1997 and 1998, but the Eagle River king salmon smolt stocking program has been terminated.

Harvest Information: Data on the harvest of small game is incomplete and not particularly indicative of population sizes. Beginning in 1998, hunters were required to report their daily small game harvest to MPs at the Main Gate. This provided information to help understand trends in small game populations.

An average of about 250 spruce grouse are harvested on Fort Richardson each year, with most being killed soon after the opening of the season. Ptarmigan harvest is insignificant with an average of about 50 per year.

Snowshoe hare harvest is very small with an average of about 100 per year. Coyote harvest information is unavailable. Coyote numbers, which in the past have been relatively high on the post, now appear to be decreasing. Studies on these and other furbearing animals are needed to more accurately understand population sizes and dynamics.

The following harvest information was obtained from the ADF&G's records and discussions with Barry Stratton, an ADF&G Fisheries Biologist. Clunie, Gwen, and Otter lakes account for most of the rainbow trout harvest. Chester Creek also receives stocked trout and accounts for a small percentage of the harvest. Small populations of rainbow trout can be found in Ship Creek, but harvest levels are minimal. Reported rainbow trout harvest for the three major trout lakes on the post for the period of 1989–1993 ranged from 8,185 to as much as 22,132. Future harvest is expected to remain at those levels. Reported landlocked salmon harvest from Clunie, Gwen, and Otter lakes for the period of 1989–1993 ranged from 1,022 to 3,802. Clunie and Otter lakes account for almost all landlocked salmon harvest. Harvest levels are expected to remain relatively constant for the next five years. Clunie Lake accounts for the vast majority of arctic char harvest. Reported harvest of arctic char/Dolly Varden for post lakes for the period of 1989–1993 ranged from 122 to 795. Dolly Varden are difficult to distinguish from arctic char. Some mis-identification and errors in survey reporting may occur. Dolly Varden are not stocked on the post, but a small population can be found in Eagle River. Harvest levels are assumed to be minimal. Harvest data for arctic grayling on the post is unavailable. Harvest data for king salmon caught within the post boundary is unavailable.

Current Management: Hunting, fishing, and trapping on Fort Richardson are conducted under regulations promulgated by the ADF&G to ensure that population numbers can be supported by the available habitat as well as being able to sustain meeting the recreational hunting demand. USARAK collects data on the harvest of game and furbearers on the post and provides these data to the ADF&G to assist the agency in promulgating harvest regulations. USARAK manages hunting and fishing on Fort Richardson in terms of areas available, dates within ADF&G seasons, safety requirements, permit and reporting requirements, and other parameters to avoid conflicts with the military mission and provide safe, high quality recreational experiences.

Moose: Harvest goals for moose have been based on producing or maintaining a specific number of animals on post. This approach considered habitat condition and moose abundance, yet focused on a finite herd size objective.

There is some concern over the amount and condition of winter range as well as moose reproductive levels (Sinnott, personal communication and Fort Richardson moose reports). Elmendorf AFB (1994) reported heavy browsing with plant mortality (especially willow) occurring. This report noted that snowshoe hares also browse on the willow. The moose harvest has been relatively stable.

A Moose Cooperative Management Plan (unsigned) (Gossweiler and Harkness, 1992) for Fort Richardson was prepared in 1992. The plan requires that any changes to the existing hunting parameters be presented to the Alaska Board of Game in a joint Army/ADF&G proposal following census and review of data.

Specific objectives of the Cooperative Moose Management Plan (Gossweiler and Harkness, 1992) were the maintenance of a herd of 600 moose (adjusted based on habitat and population data) with 35–40 bulls per 100 cows. In 2002-2006 moose harvest numbers will be based on population size and composition, reproductive status (primarily calves/100 cows), relative browsing levels (percentage of leaders browsed), and weather, with a goal of maintaining moose numbers within habitat carrying capacity. This level is dynamic, but moose populations below carrying capacity will reproduce at optimum levels to provide good sustainable harvest over the long period. The 600-moose goal has been changed recently to 500 moose.

Strategies for managing the Fort Richardson moose herd may include increasing or decreasing the number of hunters, reducing total season length, taking more moose from certain areas (e.g., the south side of the post near Anchorage), and enhancing winter habitat. Data on browse condition and moose numbers and reproduction will be used to help evaluate the success of moose management.

It is important to note the difficulty in accurately determining the carrying capacity for moose on Fort Richardson. Good productivity is normally an indicator of ample carrying capacity, but a moose herd can exceed carrying capacity and not appreciably decrease in numbers for a long time, provided winters are not severe and predation is low. It is therefore important to continually monitor productivity.

Grouse and Ptarmigan: Season dates are identified in the current ADF&G hunting regulation booklet for spruce grouse. The bag limit is five per day. Harvest levels for grouse are not expected to change over the next five years. Ptarmigan season is identified in the current ADF&G hunting regulation booklet. A daily bag limit is 10. Ptarmigan harvest levels are not expected to change over the next five years.

Furbearers: Snowshoe hare season is identified in the current ADF&G hunting regulation booklet. A daily bag limit is five. Harvest levels for snowshoe hare are not expected to change over the next five years. Coyote hunting is open on the post with a season limit of 1. Open season is in accordance with ADF&G hunting regulations. Hunting is restricted to shotguns. Immediate closures may occur at the discretion of USARAK biologists.

The trapping of furbearers is prohibited on Fort Richardson, with exception of nuisance beavers that may be removed by Natural Resources Branch personnel and/or Military Game Wardens with special State of Alaska depredation permits. Problem beavers are controlled by the Natural Resource Branch and the Wildlife Protection Section of the Law Enforcement Command (LEC).

This type of beaver control will continue through 2006. Coyotes are the only furbearer legal to hunt (shotguns only) on post. Predator control of furbearers on Army lands in Alaska will not be authorized

without the appropriate NEPA documentation, public meetings, and concurrence through Army staff channels to the Secretary of Defense.

Fisheries: Fort Richardson is part of the ADF&G Anchorage Management Area for fisheries. There are 30 stocked lakes in this management area. Five are on the post: Clunie, Gwen, Otter, Thompson, and Waldon. Dishno Pond also may be stocked and managed more intensively in the future. The stocked lakes have a significant impact on the Anchorage Management Area in that they receive 23 percent of ADF&G stocking resources. This project is mainly directed at releasing hatchery-raised fish and monitoring effort, catch, and harvest levels through the Statewide Harvest Survey.

A fish hatchery and rearing facility, located on the post on Ship Creek, is operated through the joint efforts of ADF&G and the post. In return for this Real Property lease, ADF&G stocks Fort Richardson's lakes at no cost to USARAK. Stocked species include rainbow trout, landlocked salmon, Arctic char, and Arctic grayling. Wild-stock fisheries in post waters are minimal, although small populations of Dolly Varden and rainbow trout can be found in Eagle River.

Otter and Clunie lakes attain depths of over 30 feet and may contain warm springs that provide sufficient oxygen levels for supporting fish over winter. Thompson and Waldon lakes are smaller in surface area and not as deep as Otter and Clunie lakes. They are therefore marginal in supporting over wintering fish stocks. Some years in these lakes are total failures with no fish surviving over winter. Gwen lake and Dishno pond are shallow water bodies (eight feet or less) that never have fish survive the winter.

Gwen lake supports a large population of fresh water amphipods in summer that provide a rich food source for fish stocks. The amphipod population is thought to flourish due to the fertilizer effect of the winter killed fish stocks. Rainbow trout released in Gwen lake grow faster and put on weight at higher rates than in any lake in southcentral Alaska.

Rainbow trout concentrate along the shores of Fort Richardson lakes in the spring and attempt to spawn, but due to inadequate spawning habitat, no spawning takes place in lakes. Past studies of Fort Richardson lakes have found slow growth for fish in Clunie and Thompson lakes, possibly due to tape worms that were frequently found in the intestines of fish from these lakes.

Fish are stocked in Fort Richardson's lakes throughout the year, but most commonly between mid May and September. Stocking levels for 1998–2003 are expected to remain at current levels, although they may be adjusted to reflect current angler use trends or fish availability (Barry Stratton, personal communication).

Fish Harvest: Currently, Fort Richardson hunting and fishing permits are free, but anglers are required to carry them. A State sport-fishing license is also required of all persons 16 years of age and older. Alaska's Fishing regulations are fairly lengthy and complex. They can be found in the ADF&G's annual Sport Fishing Regulations booklet.

The fishing season for rainbow trout is open continuously. The daily bag and possession limit is five, only one of which may be 20 inches or more in length. Anglers who harvest a rainbow trout that is 20 inches or more in length must immediately record their harvest, in ink, on their harvest record card. There is a seasonal limit of two rainbow trout 20 inches or more in length from Cook Inlet waters.

For landlocked salmon over 16 inches, there is no closed season. The daily bag limit is three and the possession limit is three. For landlocked salmon that are less than 16 inches, there is no closed season, but the bag limit is 10 per day with a possession limit of 10. The season for arctic char or Dolly Varden is

open continuously. The bag limit is five per day and five in possession. The season for arctic grayling also is opened continuously. A daily bag limit is five with legal possession being five.

Fish caught on the post come almost entirely from five major lakes (Clunie, Gwen, Otter, Thompson, and Waldon Lakes), that are all stocked. Dishno Pond is also usually stocked with catchable rainbow trout. ADF&G surveys indicate that Fort Richardson's lakes are a very significant resource for Anchorage area anglers. From 1977 through 1993, 14–28 percent of Anchorage area freshwater anglers fished Fort Richardson's lakes, accounting for 31 percent of the Anchorage Management Area harvest. Virtually all fish stocked in post lakes are harvested, but only after the fish are caught an average of 2½ times.

Eagle River is closed to sport king salmon fishing from its mouth upstream to the Bailey Bridge on Poleline Road. For the portion of the Eagle River upstream from the Bailey Bridge to ADF&G markers in Chugach State Park campground, the season is four consecutive 3-day weekends (Saturday–Monday) commencing on Memorial Day weekend. A daily bag limit is one per day, and a total of two fish per season is the possession limit. Anglers need a king salmon tag unless fishing for stocked king salmon in landlocked lakes. Fort Richardson waters are not stocked with anadromous king salmon.

Stocking rainbow trout is considered a “put and take” fishery. This is primarily because a lack of oxygen found in shallow water and ice cover, results in winter kill of stocked trout. Lakes that over-winter fish do so in low numbers, as a high percentage of the stocked fish are caught during the summer fishing season. Stocking levels of rainbow trout are expected to remain at or near current levels for the next five years.

Potential for Transplanting: USARAK is committed to preserving biodiversity. Prior to any introduction of a new species to the post, there will be complete NEPA documentation and consultation with partners of this INRMP. The only potential for such transplanting of wildlife in 2002-2006 is the ruffed grouse. This interior Alaska native species could add to Fort Richardson's hunting program. The ADF&G has been transplanting birds to sites just north of Anchorage. The Fort Richardson-Elmendorf AFB area is another potential site. Birds established on Fort Richardson could be hunted, and Elmendorf AFB could be used as a source of birds for additional transplants (Elmendorf AFB, 1994).

Proposed Management: Conduct fish and wildlife population management on Fort Richardson as outlined in Table 5-17.

Table 5-17. Fish and Wildlife Population Management.

OBJECTIVE	RESPONSIBLE FOR IMPLEMENTATION	PRIORITY	IMPLEMENTATION				
			2002	2003	2004	2005	2006
Annually check each hunter-harvested moose, document its location on a large scale map, determine sex, and if a bull, its rack size (small, medium or large).	USARAK Natural Resources	Medium	x	x	x	x	x
Annually stock Gwen, Otter, Clunie, Waldon, and Thompson Lake.	ADF&G	Medium	x	x	x	x	x

OBJECTIVE	RESPONSIBLE FOR IMPLEMENTATION	PRIORITY	IMPLEMENTATION				
			2002	2003	2004	2005	2006
Participate in the Ship Creek Improvement Initiative with the goal of re-establishing king and coho salmon runs, above the hatchery and below the upper dam.	USARAK Natural Resources	Medium	x	x	x	x	x
Conduct annual fish and game harvests to maintain population levels.	ADF&G	Medium	x	x	x	x	x

Other Management Alternatives Considered and Eliminated: There are other potential methods for conducting fish and wildlife population management. No other options, however, would meet the needs of the military mission. The proposed management actions listed above carefully balance the needs of the military mission, recreation, and the ecosystem. Other actions would be too minimal or would be cost-prohibitive.

5.4.4.2 Habitat Management

Description and Justification: Habitat management primarily includes the development and improvement of habitat for moose, ruffed grouse, and some landbirds, furbearers, and small mammals that prefer successional forest habitats. Some habitat improvement may also be conducted for fish and waterfowl. This project will improve habitat on up to 200 acres per year on Fort Richardson during 2002-2006. Habitat management for moose on Fort Richardson was advocated in the Anchorage Wildlife Plan (Whittaker, 1999) as a public safety measure; it is thought that prime winter habitat on Fort Richardson will keep some moose from foraging in Anchorage, and may reduce moose/human conflicts, especially traffic accidents. Conducting habitat improvement is required by Public Law 106-65 (Military Land Withdrawal Act) as mitigation for the land withdrawal LEIS and Public Law 86-797 (Sikes Act) to implement the INRMP.

Measures of Effectiveness:

- Improve the quality of habitat for selected game and nongame species.
- Emphasize habitat development and enhancement for moose, an important game and watchable wildlife species on Fort Richardson.
- Manage game habitats to support sustainable hunting and fishing programs.
- Maintain a minimum of 5,000 acres of preferred moose habitat.
- Maintain a minimum of 15,000 acres of neotropical bird habitat.
- Maintain a minimum of 4,000 acres of waterbird habitat

Habitat Management Areas: Potential habitat management areas have been created to show the likelihood of habitat manipulation in any given area. These areas are shown in Figure 5-7 and the categories of habitat manipulation are described in Table 5-18.

Table 5-18. Habitat Management Areas.

Management Area	Habitat Action	Habitat Type Desired	Size
Habitat management areas	Reduce forest density and forest understory	Medium forest canopy with open understory	? acres

Management Areas	Habitat Action	Habitat Type Desired	Size
	Reduce scrub vegetation on a rotational basis.	Primary successional habitat with low to no forest canopy and high density shrub layer	? acres
	Eliminate all woody vegetation on a permanent basis. Maintain herbaceous and grass ground cover.	Open	? acres
	Increase woody vegetative cover through wildlife improvement plantings.	Shrubland to open forest	? acres
Habitat protection areas	No habitat management or other vegetation manipulation	Protect habitat as it naturally occurs	? acres
Non-Habitat Areas	None	N/A	? acres

Management History: Fort Richardson biologists have actively managed moose foraging habitat since 1975.

Current Management: USARAK utilizes two primary methods of manipulating habitat, prescribed burning and mechanical removal of vegetation. USARAK also utilizes herbaceous and woody vegetation plantings in the cantonment area to improve habitat.

Prescribed Burning: Prescribed burning is beneficial to ecosystem maintenance on much of Fort Richardson because fire is an important component of the ecosystem's development. Prescribed burning is also favored by BLM. It is less complicated and a more natural means of vegetation removal, than using timber harvest or other mechanical means.

Mechanical Removal and Revegetation: Mechanical means of habitat manipulation are the second primary way to accomplish habitat management. Mechanical tools used to accomplish habitat management include commercial timber sales, timber stand improvement, firewood cutting, hydro-axe and military maneuver training. Habitat improvement areas are then planted with desired herbaceous species.

The primary method used to achieve high-quality/high-biomass winter moose range on Fort Richardson is centered around enhancing currently used moose habitat. Consisting of early succession deciduous plant communities with a high willow component, this habitat has grown too tall and decadent and has become highly unproductive.

Enhancement of these past-prime habitats is accomplished primarily by mechanically cutting and recycling the woody plants, using a Hydro-Ax™, prior to bud-break in the spring (April) or after vegetative growth ceases in the fall (September). An alternative method is cutting the woody vegetation at ground level by scraping the soil surface with a bulldozer blade during the late winter when the ground is frozen. Mechanically cutting desirable deciduous plants causes prolific resprouting from intact root crowns thereby increasing the annual production and growth rates during successive growing seasons.

A second method of increasing winter moose range on Fort Richardson involves converting forested areas, which have little value for moose habitat, to early succession deciduous plant communities. The forest removal operation can be accomplished by use of the Hydro-Ax™ with the rotary cutting head for small trees up to three inches in diameter. Larger trees can be removed by shearing them off with the feller-buncher attachment on the Hydro-Ax™. The trees also can be removed in late winter when the ground is frozen, using a bulldozer to snap off trees and other woody vegetation at ground level. Deciduous rootstocks in the soil will resprout and produce woody vegetation communities of willow, birch, and aspen, all desirable browse for moose. Undesirable plant species, e.g., alder and spruce, will also become established and will be a component of the vegetative community.

A third method for increasing winter moose range on Fort Richardson is to plant willow shoots or bundles in areas desirable for this treatment (recently cleared areas with low density willow root stocks and a low perennial grass component, e.g., primarily *Calamagrostis* and *Arctagrostis* species). Willow shoots must be collected in March or early April prior to flowering and placed in cold storage until planting time in June. The roots must be treated with a growth hormone to promote adequate root development.

Removal of trees for forest management, personal use, or military purposes also can improve moose habitat in some cases. Treatments could include salvage operations and construction and clearing for right-of-ways. Since the cost of these treatments would be incurred anyway, the additional cost for improving moose habitat would be minimal unless special efforts, such as additional removal, planting, or chemical controls, are undertaken. For example, if cutting firewood removes trees greater than four inches in diameter, it is less expensive to use the Hydro-Ax™ to complete a moose habitat improvement project.

Competition from *Calamagrostis* spp. can be reduced by using chemicals such as Roundup®, which would cost about \$100 per acre. USARAK is providing a study area to the USFS in cooperation with Oregon State University for experiments with this chemical as part of a spruce regeneration study. The ADF&G's biologists report relatively poor success using only Roundup® to control *Calamagrostis* spp. (Bill Collins, pers. com.). The chemical effectively kills the grass, but does not guarantee immediate establishment of other, more desired species. One solution might be to plant willow shoots and disseminate birch seed in the treated area. Fire will remove this grass, but it is generally too hot and fast to expose the mineral soil. Additionally, prescribed burning is not an option due to air quality restrictions by the Municipality of Anchorage. Mechanical scarification is needed to expose this soil if willow and other species are to successfully regenerate and compete with the grass.

There are at least two methods for improving moose-browse habitat in terms of the type of areas to be treated. The first of these is to improve habitat already vegetated with species preferred by moose. On Fort Richardson, willow is the browse preferred by moose, but balsam poplar, birch, and aspen are also of some value. In general, areas with these species are on the coastal plain below 500 feet in elevation.

The other method is to convert areas not already rich in good forage plants to species that are preferred by moose such as willow and birch. This is accomplished most commonly by converting areas dominated by spruce to willow or by planting willow in areas that have been disturbed, perhaps in conjunction with LRAM activities. Converting spruce to moose forage habitat is possible on drier sites, but burning would be needed to keep spruce from regenerating and outcompeting the browse species. The best tactic would be to burn the area five to six years after removing the spruce overstory. This would kill the spruce seedlings, and further regeneration would be unlikely because spruce seed remains viable only for about two years. However, as burning is not an option on Fort Richardson, this technique will not be considered.

A more realistic option would be to let the deciduous plants grow with the spruce seedlings and then Hydro-Ax™ the spruce once they begin to dominate the browse species. The woody shrubs would resprout, whereas the spruce would die.

The proximity of vertical cover or the “edge effect” does not appear to be as important to moose as it is to other species, especially during winter. There is considerable evidence (Bill Collins, pers. com.) that moose will use feeding areas that are a considerable distance from cover in the winter. During periods of hot sunny weather, moose move relatively long distances to find cover for shade. In winter, moose are likely to use cover to evade harassment or predation rather than protection from the elements. Treated areas normally provide cover within several years.

It is important to expose areas managed for moose browse to maximum sunlight. Long, narrow areas that are largely shaded are not conducive to good browse production. Ideally, treatment areas, particularly small ones, should be round or square in shape to maximize their exposure to sunlight. USARAK will treat areas that range between 10 to 40 acres, or even larger in some cases. Areas will be shaped to maximize exposure to sunlight. If areas greater than 40 acres are treated and birch is the desired regeneration species, islands of birch will be left as seed sources. These islands are also useful for moose bedding, especially during warmer days.

Rotation age is a forestry term, but it is also appropriate for the regular renovation of wildlife habitat. It can take from two to five years to produce quality browse following Hydro-Ax™ treatments to stimulate regrowth in old and unproductive moose habitats. It may take even longer (up to ten years) to produce high quality moose browse in forested areas newly cleared for moose habitat. Preferred vegetation may last 10 to 12 years before unbrowsed species such as alder and spruce grow tall enough to dominate and shade out the desirable woody plants. A 12 to 15-year rotation schedule is therefore planned for re-treating established moose browse areas.

The time of year for re-treating overgrown moose habitat is important. Cutting vegetation when food reserves are stored in the upper part of a plant can reduce vigor and weaken its condition for several years. Woody shrubs should be cut in April, before carbohydrate reserves are translocated from the roots to the above-ground portions of the plant, or in September, after the growing season has ended and food reserves have been stored in the roots. Cutting vegetation in April is desirable because it produces quick and vigorous regrowth, providing an available food source within 6 months after treatment.

Another important factor is the height at which stems are cut. To induce sprouting from the roots, young woody shrubs should be cut within two to four inches above the ground surface. Older woody shrubs can be cut higher from the ground surface and still result in root sprouting. Cutting eight inches above the ground may not eliminate small spruce seedlings, which would defeat the purpose of the treatment.

Depending on tree size (maximum 4" diameter) and density, the Hydro-Ax™ with the rotary head attachment can treat from 5 to 10 acres of over-mature moose habitat per day. Effective Hydro-Ax™ treatment normally will require a single pass over the vegetation for proper cutting and mulching of the woody stems and saplings. Where whole or nearly whole stems and saplings remain after one pass, a second pass with the Hydro-Ax™ may be required to complete the mulching so that only small woody pieces remain. Because decay is very slow in northern environments, it is important to ensure that adequate mulching of the vegetation takes place. This will encourage rapid breakdown and expedite the release of tied up nutrients that are crucial for successful regrowth.

Sites selected for habitat improvement will be placed within one of 12 habitat treatment groups. Each treatment group will encompass approximately the same number of total acres. Component sites within

each of the 12 treatment groups will be selected in such a way as to ensure that each group has widespread and even distribution throughout the post. The objective is to have selected sites north of Eagle River (i.e., Neibar Drop Zone, McLaughlin Range, the firewood cutting areas, and other previously cleared forest sites), within the cantonment area and north of the Glenn Highway (i.e., cemetery, landfill, antenna field, Bryant Army Air Field, Bartlett High School, and Ammo Area A), and south of the Glenn Highway (i.e., small arms complex, McVeigh Marsh, Bunker Hill area, clear cut plots, and other previously cleared forest sites).

Each of the 12 habitat treatment groups will receive treatment during one of the next 12 years. The timing of the treatment for any one site will be based on current age and condition of the vegetation. Treatment rotation for moose habitat will be delineated on the GIS. The Hydro-Ax™ will be scheduled for use at each site, but may require short term adjustments. For example, a very cold winter might open the option of using a bulldozer to snap trees, or mechanical breakdowns could mandate the use of other equipment.

Long term adjustments may become necessary if equipment or operators are unavailable in any given year, or unforeseen deficiencies in moose habitat become evident in certain areas, or for other practical reasons. These long-term changes will be tracked using the GIS.

Wildlife Habitat Improvement Plantings: This component of habitat improvement includes management of the cantonment area that directly affects natural resources management. Routine ground maintenance on Fort Richardson is accomplished primarily by Grounds Maintenance, DPW. The *Installation Design Guide* (Higginbotham / Briggs & Associates, 1991) and the *Landscape Design Plan* (David Evans and Associates, Inc., 1987) provide information on using trees and shrubs for landscaping. Both documents provide lists of plant materials appropriate for use on Fort Richardson.

This INRMP does not include routine ground maintenance unless it is specifically designed for the benefit of natural resources. Natural resources personnel provide professional assistance for landscaping, particularly regarding species selection and care of the landscape.

Proposed Management: Conduct habitat management on Fort Richardson as outlined in Table 5-19.

Table 5-19. Habitat Management Actions.

OBJECTIVE	RESPONSIBLE FOR IMPLEMENTATION	PRIORITY	IMPLEMENTATION				
			2002	2003	2004	2005	2006
Conduct wildlife planting in urban areas.	USARAK Natural Resources	Medium	x	x	x	x	x
Improve and enhance moose habitat.	USARAK Natural Resources	Medium	149.7 acres	121.1 acres	129 acres	118.6 acres	115.4 acres
Enhance up to 200 acres annually of military training habitat.	USARAK Natural Resources	Medium	x	x	x	x	x
Enhance up to 30 acres per year of ruffed grouse habitat.	USARAK Natural Resources	Medium	x	x	x	x	x
Control bluejoint grass on an opportunistic basis.	USARAK Natural Resources	Low	x	x	x	x	x
Block vehicular access, including off-road vehicles, to riparian areas along lakes.	USARAK Natural Resources	Medium				x	

OBJECTIVE	RESPONSIBLE FOR IMPLEMENTATION	PRIORITY	IMPLEMENTATION				
			2002	2003	2004	2005	2006
Improve habitat by closing and revegetating unnecessary trails.	USARAK Natural Resources	Medium	x	x	x	x	x
Evaluate the relationship between moose numbers and habitat carrying capacity and identify areas where habitat improvement is most needed.	USARAK Natural Resources	Low		x			
Create snowshoe hare habitat by piling together brush from debris left from various projects.	USARAK Natural Resources	Low	x	x	x	x	x
Enhance silver salmon habitat quality in Chester Creek.	USARAK Natural Resources	Low					x
Improve waterfowl habitat by dredging pertinent sections of McVeigh Marsh	USARAK Natural Resources	Low					x

Other Management Alternatives Considered and Eliminated: There are other potential methods for conducting habitat management. No other options, however, would meet the needs of the military mission. The proposed management actions listed above carefully balance the needs of the military mission, recreation, and the ecosystem. Other actions would be too minimal or would be cost-prohibitive.

5.4.5 Fish and Wildlife Management Responsibilities

ADF&G has the primary responsibility for managing fish and wildlife game populations. ADF&G sets population goals and carries out fish stocking on Fort Richardson. USFWS is primarily responsible for managing nongame populations of fish and wildlife. USARAK is responsible for working together with these two agencies to conduct habitat management on Fort Richardson. Routine grounds maintenance on Fort Richardson is the responsibility of Roads and Grounds Maintenance, DPW.

5.5 Endangered Species Management

There are no known federally endangered or threatened species on Fort Richardson, but there are some rare, uncommon, and/or conservation priority species. The endangered species management program at Fort Richardson deals primarily with these rare, uncommon, and/or conservation priority species.

The endangered species program is integrated fully with other natural resource programs, especially ecosystem management. Because there are no federally listed, endangered or threatened species on Fort Richardson, all actions that protect, conserve, or enhance habitat for rare, sensitive, uncommon, and/or conservation priority species are listed under other program areas.

5.5.1 Endangered Species Management Goals

Endangered species management goals all contribute to one or more of the overall natural resources program goals of stewardship, military training support, compliance, quality of life, and integration. The endangered species management goals for Fort Richardson are:

- Protect and conserve habitat for endangered, threatened, rare, sensitive, uncommon and/or conservation priority species on Fort Richardson.
- Identify and delineate endangered species distributions and their preferred habitats on Fort Richardson.
- Conduct appropriate Section 7, Endangered Species Act consultation for any actions that may impact endangered species.

5.5.2 Endangered Species Planning

Endangered, threatened, or rare species program management and planning includes all the planning, budgeting, contract oversight, and organization necessary to implement the endangered species program. The primary emphasis for this component of the endangered species management program is to ensure that rare, uncommon, and/or conservation priority species are included for management in the ecosystem management plan (see Chapter 3). There will be no endangered species management plan for Fort Richardson unless a federally listed endangered or threatened species is found on Fort Richardson.

5.5.3 Endangered Species Inventory and Monitoring

Inventory and monitoring for endangered species is accomplished through other program surveys. One of the objectives for the planning-level flora and fauna surveys was to determine if any endangered or threatened species occur on Fort Richardson. In the process of LCTA monitoring, in which vegetation is monitored across the entire post, natural resources staff continues to look for potential threatened or endangered plant species. Through landbird and waterbird monitoring, staff also continues to look for threatened or endangered bird species. Rare, sensitive, uncommon, and/or conservation priority species found on Fort Richardson will be identified, and locations mapped, through these planning-level survey and monitoring efforts.

For vascular plants, the Alaska Natural Heritage Program's Plant Tracking Database is used to guide efforts to locate uncommon taxa, and for birds, the National and Boreal Partners In Flight Program's listings of conservation priority species are used. There are no similar lists of species of conservation concern for mammals, but species known to be rare nationwide and/or in Alaska are sought in survey and monitoring efforts.

5.5.4 Endangered Species Management

Endangered species management involves protecting, conserving, and enhancing habitat for rare, sensitive, uncommon, and/or conservation priority species.

Description and Justification: Endangered species management involves protecting, conserving, and enhancing habitat for rare, sensitive, uncommon, and/or conservation priority species. There are no known federally endangered or threatened species on Fort Richardson, but there are a number of rare, uncommon, and/or priority species. Endangered, threatened, and rare species management on Fort Richardson entails monitoring and protection of sensitive habitat for bird, mammal, and plant species. Conducting endangered and threatened species management is required by the Endangered Species Act and by Public Law 86-797 (Sikes Act) to implement the INRMP.

Measures of Effectiveness:

- Protect all threatened and endangered species' and their habitats on Fort Richardson.
- Monitor annually to locate any threatened or endangered species on Fort Richardson.

- Receive no jeopardy opinions for threatened or endangered species.
- Conserve habitat for rare, sensitive, uncommon, and/or conservation priority species on Fort Richardson.

Management History: Threatened and endangered species surveys have been conducted in conjunction with a number of surveys since 1995. No threatened or endangered species was located in the 1995 floristic inventory, the 1997 wetlands inventory, the 1998 vegetation mapping project, the 2000 ecological land survey, or during annual LCTA monitoring and landbird and waterbird monitoring efforts.

Current Management: Current management for endangered species is limited to continuing the ongoing search to locate potential endangered or threatened species.

Proposed Management: Continue endangered species management on Fort Richardson as outlined in Table 5-20.

Table 5-20. Endangered Species Management.

OBJECTIVE	RESPONSIBLE FOR IMPLEMENTATION	PRIORITY	IMPLEMENTATION				
			2002	2003	2004	2005	2006
Continue surveying for threatened and endangered species on Fort Richardson.	USARAK Natural Resources	High	x	x	x	x	x
Conserve habitat for rare, sensitive, uncommon, and/or conservation priority species through actions listed under habitat management and fish and wildlife management.	USARAK Natural Resources	High	x	x	x	x	x
Implement Bald Eagle habitat protection by developing primary and secondary zones for each eagle nesting site.	USARAK Natural Resources	Medium	x	x	x	x	x
Implement the USFWS general measures for the management and protection of eagle habitat.	USARAK Natural Resources	Medium	x	x	x	x	x

Other Management Alternatives Considered and Eliminated: There are no other options to endangered species management. If an endangered species is located on Fort Richardson, USARAK is legally mandated to take appropriate steps to protect habitat for that species. Other actions would be too minimal or would be cost-prohibitive.

5.5.5 Endangered Species Program Responsibilities

US Fish and Wildlife Service is responsible for administering the Endangered Species Act. USARAK is responsible for continuing to locate any species that are listed as threatened or endangered on Fort Richardson. USARAK is responsible for conducting Section 7 consultation with USFWS for any actions that may affect endangered or threatened species.

5.6 Special Interest Areas Management

Designation of special protection status for important or fragile natural areas is an effective management tool. In accordance with AR 200-3, areas that contain natural resources that warrant special conservation efforts will be identified during the inventory and classification process. After appropriate study and coordination, such areas may be managed as special interest areas for their unique features. Per AR 200-3, this INRMP “*will address the special management necessary for these areas, and all current and future land uses will consider the uniqueness of these areas and plan accordingly to ensure conservation of their resources.*”

5.6.1 Special Interest Areas Goals

Special interest areas management goals all contribute to one or more of the overall natural resources program goals of stewardship, military training support, compliance, quality of life, and integration. The goals for special interest areas management are:

- Identify and provide protection for areas of special ecological or cultural concern.

5.6.2 Special Interest Areas Management Plan

Special interest areas program management and planning includes all the planning, budgeting, contract oversight, and organization necessary to implement the special interest areas program. The primary emphasis for this component of the special interest areas program is the preparation and update of the special interest areas management action plan every five years.

Description and Justification: Prepare, update, and implement a special interest areas management action plan for Fort Richardson. The special interest areas management action plan identifies, delineates, and proposes measures to protect and conserve special interest areas on Fort Richardson. Updates of the special interest area management plan are required by Public Law 86-797 (Sikes Act) every five years to implement the INRMP. Per Memorandum DAIM-ED-N, 21 March 1997, this component of the INRMP is a class 1 requirement.

Measures of Effectiveness:

- Complete, update, and maintain a special interest areas management action plan.
- Decrease disturbance in special interest areas on Fort Richardson.
- Involve resource agencies in the planning process for special interest areas management, and the public in review of the plan.

Management History: The first special interest areas management action plan for Fort Richardson was completed in 2001.

Current Management: Current management actions to update the special interest areas management action plan will cease in 2002. If this INRMP is not approved and funded, no new special interest areas action management plan will be prepared, updated, or implemented. Policies already in place in the current special interest areas management action plan will continue.

Proposed Management: Prepare and update the special interest areas management action plan as outlined in Table 5-21.

Table 5-21. Special Interest Areas Management Action Plan.

OBJECTIVE	RESPONSIBLE FOR IMPLEMENTATION	PRIORITY	IMPLEMENTATION				
			2002	2003	2004	2005	2006
Prepare annual updates of the special interest areas management action plan.	USARAK Natural Resources	High	x	x	x	x	x
Prepare and update special interest areas management action plan for the planning period of 2007-2011.	USARAK Natural Resources	High					x
Complete NEPA documentation for update	USARAK Natural Resources	High					x

Other Management Alternatives Considered and Eliminated: There are no alternatives to maintaining a current special interest areas management action plan with updates at least every five years. NEPA documentation is also legally mandated.

5.6.3 Special Interest Areas Inventory and Monitoring

Inventory of special interest areas is conducted to locate, identify, delineate, and map areas of unique or sensitive status. Annual monitoring is accomplished through other programs, such as LCTA, aerial monitoring, and fish and wildlife monitoring.

5.6.4 Special Interest Area Management

Designation of special protection status for sensitive or fragile areas is an important management tool. It is easier and more cost effective to place restrictions on the use of some areas, to minimize damage or disturbance, than to repair damage or disturbance after it has occurred.

Description and Justification: Manage special interest areas on Fort Richardson. Special interest areas on Fort Richardson are old-growth forest areas, krummholz forest areas, alpine tundra areas, cultural resource areas, Ship Creek riparian area, Eagle River corridor, other riparian areas, lakes, Eagle River Flats, other wetlands, and the Glenn Highway greenbelt. Special interest areas will be individually managed according to their specific needs. Conducting special interest area management is required Public Law 86-797 (Sikes Act) to implement the INRMP.

Measures of Effectiveness:

- Reduce impacts in wetlands, riparian areas, lakes, alpine tundra areas, old-growth forests, krummholz forests, and historic cultural sites.
- Reduce the impact of training and recreation activities in special interest areas.

Management Areas: Special Interest Areas on Fort Richardson include old-growth forest areas, krummholz forest areas, alpine tundra areas, cultural resource areas, Ship Creek riparian area, Eagle River corridor, other riparian areas, lakes, Eagle River Flats, other wetlands, and the Glenn Highway greenbelt. Other areas affording protection under the special interest area program include McVeigh Marsh Waterfowl Refuge, Otter Lake and Otter Creek Wildlife and Recreation Area, Gwen Lake Wildlife and Recreation Area, Clunie Lake Wildlife and Recreation Area, Waldon Lake Wildlife and Recreation Area,

North Fork Campbell Creek Anadromous Fish Stream, and Chester Creek Anadromous Fish Stream. The locations of these special interest areas are shown on Figure 2-11.

Management History: These special interest areas have been protected since 1998 as they are included in the environmental limitations overlay for Fort Richardson (see this chapter, Section 5.1.4), effectively reducing the impact on these areas from military activities.

Current Management: Special interest area management includes protecting special interest areas through regulations, map overlays showing restrictions, and actual barriers. USARAK Regulation 350-2, *Range Regulation*, has many general provisions to protect environmental resources, including special interest areas, on Fort Richardson. The provisions include:

- NEPA review of actions affecting natural resources.
- Restoration of sites damaged by digging.
- Removal of wire, rope, string, concertina wire, and other training debris.
- Wildfire prevention measures.
- Preference for use of established roads and trails.
- Stream crossing requirements.
- Protection of trees with diameters greater than four inches.
- Prohibitions on harassment of wildlife.
- Spill prevention and containment measures.
- Hazardous materials handling procedures.
- Coordination of ground-disturbing activities with the Natural Resources Branch.
- Controls on outdoor recreation, including swimming, hunting, fishing, and firewood cutting.

Military mission-related restrictions within special interest areas are included in the environmental limitations overlay map and environmental awareness materials prepared for distribution to military units who use training areas on Fort Richardson. Most military mission-related restrictions involving special interest areas have been in place for some time with no significant adverse impacts on accomplishment of the mission. Physical barriers can be used to protect special interest areas. However, this is only used in extreme cases because barriers tend to draw attention to an area.

Proposed Management: Conduct special interest areas management on Fort Richardson as outlined in Table 5-22.

Table 5-22. Special Interest Areas Management.

OBJECTIVE	RESPONSIBLE FOR IMPLEMENTATION	PRIORITY	IMPLEMENTATION				
			2002	2003	2004	2005	2006
Manage and protect old-growth forest areas	USARAK Natural Resources	Medium	x	x	x	x	x
Manage and protect krummholz areas	USARAK Natural Resources	Medium	x	x	x	x	x
Manage and protect alpine tundra areas	USARAK Natural Resources	Medium	x	x	x	x	x
Manage and protect cultural resource areas	USARAK Natural Resources	Medium	x	x	x	x	x
Manage and protect Ship Creek riparian area	USARAK Natural Resources	Medium	x	x	x	x	x

OBJECTIVE	RESPONSIBLE FOR IMPLEMENTATION	PRIORITY	IMPLEMENTATION				
			2002	2003	2004	2005	2006
Manage and protect Eagle River corridor	USARAK Natural Resources	Medium	x	x	x	x	x
Manage and protect other riparian areas, lakes, and wetlands	USARAK Natural Resources	Medium	x	x	x	x	x
Manage and protect Eagle River Flats	USARAK Natural Resources	Medium	x	x	x	x	x
Manage and protect the Glenn Highway greenbelt	USARAK Natural Resources	Medium	x	x	x	x	x

Other Management Alternatives Considered and Eliminated: There are other potential methods for conducting special interest areas management. No other options, however, would meet the needs of the military mission. The proposed management actions listed above carefully balance the needs of the military mission, recreation, and the ecosystem. Other actions would be too minimal or would be cost-prohibitive.

5.6.5 Special Interest Area Responsibilities

USARAK has primary responsibility for the management of special interest areas. Within USARAK, DPW has the responsibility to locate, identify, monitor, and manage special interest areas. DPTSM Range Control provides control over access into these areas.

5.7 Pest Management

5.7.1 Pest Management Goals

Pest management goals all contribute to one or more of the overall natural resources program goals of stewardship, military training support, compliance, quality of life, and integration. The pest management goals for Fort Richardson are:

- Meet requirements defined by the Army for pest management program measures of merit.
- Use alternative pest management strategies (sanitation, trapping, biological control, mechanical control, etc.).
- Select the least toxic pesticides, if pesticides must be used.
- Select precision application techniques that target specific pests and habitats.
- Emphasize education, communication, monitoring, inspection, and record keeping.

5.7.2 Pest Management Plan

Pest Management program management and planning includes all the planning, budgeting, contract oversight, and organization necessary to implement the pest management program. The primary emphasis for this component of the pest management program is the preparation and update of the installation pest management plan, at least every five years.

Description and Justification: Maintain and update the installation pest management plan. Fort Richardson updated its Installation Pest Management Plan (IPMP) in 1996. The goal of the IPMP is to

minimize the adverse environmental impacts of using pesticides while achieving an acceptable level of control and cost-effectiveness. Completion and updates of the plan are required to meet USARPAC pest management measures of merit. This plan discusses specific actions necessary to accomplish pest management on Fort Richardson. Pest management planning is a requirement AR 200-5. Updates of the pest management plan are required by Public Law 106-65 (Military Land Withdrawal Act) as mitigation for the land withdrawal LEIS, and by Public Law 86-797 (Sikes Act) every five years to implement the INRMP. Per Memorandum DAIM-ED-N, 21 March 1997, this component of the INRMP is a class 1 requirement.

Measures of Effectiveness:

- Complete, maintain, and update a pest management plan for Richardson.
- Meet the pest management measures of merit through pest management planning.
- Designate a qualified/trained pest management coordinator.
- Continue to reduce pesticide use.
- Involve resource agencies in the planning process for pest management, and the public in review of the plan.

Management History: The Fort Richardson pest management plan was first completed by ERD in 1998. The plan was updated by the Corps of Engineers in 2000.

Current Management: Current management actions to update the installation pest management plan will cease in 2002. If this INRMP is not approved and funded, no new pest management plan will be prepared, updated, or implemented. Policies already in place in the current pest management plan will continue.

Proposed Management: Prepare and update the installation pest management plan for Fort Richardson as outlined in Table 5-23.

Table 5-23. Installation Pest Management Plan.

OBJECTIVE	RESPONSIBLE FOR IMPLEMENTATION	PRIORITY	IMPLEMENTATION				
			2002	2003	2004	2005	2006
Prepare annual updates of the installation pest management action plan.	USARAK Natural Resources	High	x	x	x	x	x
Prepare and update installation pest management action plan for the planning period of 2007-2011.	USARAK Natural Resources	High					x
Complete NEPA documentation for update	USARAK Natural Resources	High					x

Other Management Alternatives Considered and Eliminated: There are no alternatives to maintaining a current installation pest management plan with updates at least every five years. NEPA documentation is also legally mandated.

5.7.3 Pest Inventory and Monitoring

Pest inventory and monitoring is accomplished through surveys by pest control personnel. Other natural resource monitoring efforts also contribute to pest inventory and monitoring. LCTA, in particular, monitors vegetation annually and identifies any invasive and exotic plant species in the training areas.

5.7.4 Pest Management

Measures of Merit: In 1994, the Department of Defense developed a Measures of Merit Program for all military installations which requires a Pest Management Plan to be prepared, signed, and implemented. Other requirements include the reduction of pesticide use on all installations by 50 percent over a seven year period (1994–2000) and certified training of all pest control personnel.

Installation Pest Management Plan: Fort Richardson has a recently completed and approved Pest Management Plan. Reduction in pesticide use on Alaskan installations is being closely coordinated with USARPAC. All Alaskan Army pest control personnel are in compliance with the basic training certification required by Measures of Merit.

Chemical Use: All chemicals used on Fort Richardson are EPA-approved. Pesticide use on Fort Richardson has fallen dramatically over the last two years. Significant decreases in the number of soldiers based on the post has contributed to that reduction. Remodeling and new construction have also helped reduce the volume of pesticides used since these buildings are more pest resistant and new construction usually has fewer pest problems.

Reduced chemical use is a major goal of the pest management program. USARAK understands obvious and long-term threats to both humans and ecosystems from chemical abuses. The Pest Management program has switched emphasis to emphasizing surveillance before chemical application. More efficient equipment and techniques are adding to the reduction in chemical volume and toxicity.

The most difficult objective for Fort Richardson is the reduction of herbicides. In general, the acreage of improved grounds has not been reduced enough to allow for a 50 percent reduction in herbicides without changing the appearance of the post. Reduced grounds maintenance has eliminated about 1/8th of improved grounds since 1993, but significant future reductions are unlikely. Dandelion (an exotic species) control is especially difficult to achieve if herbicide reduction objectives are implemented.

Pesticide Certification: At present, Pest Control has three certified applicators, and the golf course also has one. These positions are needed to provide minimum in-house capabilities. These personnel will undergo required refresher training, and any new personnel will receive training required for certification. USARAK has the option to use a combined Army, Navy, and Air Force pesticide training facility in Hawaii or the Army school at Fort Sam Houston, Texas.

Invasive and Exotic Plant Control: The primary noxious plant community on Fort Richardson is bluejoint grass (*Calamagrostis* spp.). Although a native species, it is undesirable in some locations since it replaces native spruce and birch forest. This perennial grass is a primary invader of areas that have been opened to at least 40 percent sunlight. These conditions often are associated with range construction or spruce bark beetle outbreaks. As described below there are at least three ways to control bluejoint grass:

- Burning can be effective if fires are hot enough. Late summer burning conditions are generally too “green” for hot burns unless some sort of desiccant is sprayed to dry out green vegetation or there is fallen timber, such as from an earlier spruce bark beetle outbreak. Frozen soils are often a problem until greenup. Timing is ideal in late May or early June if soils are thawed or there is dead wood on the ground in sufficient quantities to generate the needed heat. The Chugach

National Forest has a prescribed burning program (Dr. Ed Holsten, pers. com.). Air quality permits for burning, however, are difficult to obtain.

- Blade scarification is a possibility. This works well in interior Alaska where there are deep alluvial soils. There is a question as to whether soils on Fort Richardson are deep enough to allow scarification without drastic loss of topsoil. Scarification must be deep enough to get bluejoint grass rhizomes (Dr. Ed Holsten, pers. com.). Shallow soils on Fort Richardson reduce the viability of this option.
- The low toxicity herbicide called Roundup® does an excellent and effective job of killing this grass if applied late in the fall.

Dandelion (*Taraxacum* spp.) control constitutes the major herbicide use in the Fort Richardson cantonment area. Dandelions and other broad-leaf weeds are controlled throughout the cantonment area, with emphasis on high visibility areas.

Soil sterilants are used in areas where bare ground is required. Such areas include target areas on small arms ranges, ammunition storage facilities, live fire ranges where soldiers lie on the ground to shoot, and special areas where duds must be removed, such as hand grenade ranges.

A researcher studying spruce regeneration on Fort Richardson has used small quantities of Roundup® to control competition on sites where various treatments are being tested. The main species being controlled is bluejoint grass. Early fall treatment with this herbicide has shown promising results in terms of reducing competition for young spruce trees.

Devil's club (*Oplopanax horridus*) is considered noxious due to its thorns that prevent use of areas where it abounds. But, unless it is within the cantonment area, it is not controlled.

Alder (*Alnus* spp.) is considered noxious since it invades quickly after disturbance and prevents the establishment of more desired species. Alder, however, is also a nitrogen-fixing species and serves an important purpose in plant succession. It is not specifically controlled except for specific situations such as in moose habitat improvement.

Wildlife Conflicts: Wildlife conflicts on Fort Richardson, ranging from insects and small rodents to large mammals such as moose and bears, are handled by three Command entities: USARAK Natural Resources, Provost Marshal's Office, and Pest Control Section of the DPW. The Provost Marshal and Natural Resources Branch, assisted by ADF&G, manage problems with large mammals. Small species, such as birds, rodents, and insects, are managed by the Pest Control Section.

Animal Damage Control (ADC), US Department of Agriculture, has skills useful in resolving conflicts with wildlife. USARAK will use ADC on a reimbursable basis as required during the next five years through interagency fund transfers (MIPRs).

Although no formal agreement exists for interdepartmental pest management on Fort Richardson, the following breakdown of responsibilities and policies by species usually applies:

Domestic Pets: Cats and dogs running loose within the cantonment area and on the ranges are the responsibility of the Provost Marshal using Military Police personnel. This is not normally done by Military Game Wardens but is taken care of by Military Police regular road units. Military Police road units and Military Game Wardens have access to standard equipment such as slip nooses and tranquilizer guns but are not properly or routinely trained for use of dart guns on domestic animals. For this type of assistance, USARAK Natural Resources, Elmendorf AFB Game Wardens or ADF&G are notified. Generally, stray dogs and cats are a minor problem at Fort Richardson.

Insects and Small Mammals: Pest Control handles insect and small mammal problems within the cantonment area. Common pest problems include German cockroaches (the biggest problem on the post), mosquitoes, spiders, ants, fleas, hornets and wasps, silverfish, firebrats, beetles, and small mammals such as shrews, deer mice, voles, and squirrels.

Beavers: Beavers occasionally create problems on Fort Richardson by plugging water intake pipes, preventing natural drainage of lakes and ponds, and denuding lake shores of vegetation. Overflow resulting from dammed areas leads to erosion of trails and roads and problems with power-plant intakes. Beavers causing significant problems are controlled by USARAK Natural Resources, and the Military Game Wardens under depredation permits issued by ADF&G.

Moose: The Fort Richardson Natural Resources Branch and the Military Game Wardens jointly handle moose complaints and investigate injured and road-killed animals. Road-killed moose must be reported to the Alaska State Troopers as soon as possible so that the meat can be salvaged. The Fort Richardson Chaplain's office maintains a list of eligible charity recipients for salvageable meat. Road-killed moose on Fort Richardson are a relatively small problem with fewer than six killed annually.

Conflicts sometimes occur between moose and people during calving season and have resulted in injuries and, in rare instances, death. Closure of trails and placement of warning signs until cows with young calves have left the area has proven effective in reducing such conflicts.

Bears: The Fort Richardson/Elmendorf AFB area has an estimated 30-40 black bears (including sows with cubs) and three to five brown bears. Bears occasionally damage homes, facilities, and personal property, and sometimes injure, or even kill, people (the latter being relatively rare).

Initial response to a potential bear problem on Fort Richardson is carried out by the Military Game Wardens. It is their responsibility to assess the situation and determine if more assistance is needed. In most cases, the responding officers can resolve the problem by temporarily restricting public access to the area until the animal leaves or by chasing the bear away. The latter is accomplished by first using cracker rounds and then, if that does not work, rubber bullets. As soon as is practical, responding officers will notify USARAK Natural Resources, either by telephone or radio, of the situation and how it was resolved. As with all wildlife encounters on USARAK-controlled lands, unless the animal poses a serious threat to human safety or is critically injured, no action will be taken by initial responders that might result in injury or death to the animal without authorization from the USARAK Chief of Natural Resources or the USARAK Chief of Environmental Resources.

If initial responders determine that the situation warrants further assistance they will immediately notify, by radio or telephone, both USARAK Natural Resources and the Elmendorf AFB Conservation office. Subsequent procedures to be followed are outlined in a multi-agency memorandum of agreement for dealing with bear/human conflicts on both military installations. This Memorandum of Agreement (MOA) provides for the establishment of a joint human/wildlife conflict advisory board and includes specific responsibilities of each agency involved.

Mountain and glacier training are a key element in USARAK mission. A Land Use Permit from the State of Alaska enables USARAK soldiers to conduct training exercises on the nearby Knik Glacier. A stipulation of the permit was the preparation and implementation of a Bear Management Plan to reduce the potential for bear and human interaction during this training. The plan, as prepared and used since 1990, will continue to be implemented until superseded or revised.

Cliff Swallows: Construction of nests by cliff swallows in post housing areas and work facilities creates a nuisance and health concern. Droppings are unsightly and are a growth medium for a fungus that can cause respiratory infection (histoplasmosis). Swallows also are infested with mites (Elmendorf AFB, 1994).

The Fort Richardson Pest Control Shop responds to calls regarding swallow nesting problems within the cantonment area. The most practical and ethical way to resolve these conflicts is to remove or destroy the nests prior to egg laying. In the past, permits from both ADF&G and the USFWS have been required to remove swallow nests. In 1997, the USFWS suspended the requirements for a permit to remove swallow nests. In lieu of the permit, they requested a report at the end of the season describing the nests that were removed. ADF&G still requires permits be obtained but allows nests with eggs to be removed under special conditions such as where droppings near windows or doors may affect human health, or around electrical power boxes. USARAK will continue to ensure that ADF&G permits are applied for on a yearly basis. The potential of using nesting platforms to attract swallows away from family housing quarters, aviation hangars, and other buildings will be investigated. Other remedies may include the use of repellent structures and materials in areas where nesting activity is discouraged.

Predator Control: There is a special provision contained within the Alaska administrative code requiring US Army concurrence before any wolf control activities can be performed on military lands in Alaska²⁷. Any predator control on Fort Richardson must be approved by USARAK, US Army Pacific, and Department of Army and documented using the NEPA process.

Other Animals: Pest Control handles most other animal problems as required. These include squirrels in attics and crawl spaces, rabid animals, etc. Each problem is evaluated individually for appropriate action. All other wildlife control problems are handled on a case-by-case basis by the Natural Resources Branch in cooperation with the Military Game Wardens.

Injured Animals: Injured animals often are reported to the Military Game Wardens, especially if they are discovered after normal duty hours. Moose injured in motor vehicle accidents are one example of such incidents. Injured wild animals are a specialized problem that often requires the expertise of wildlife biologists to make decisions regarding rehabilitation or destruction of the animals. For this reason, the Military Game Wardens are required to contact personnel within USARAK Natural Resources prior to dealing with injured animals. Post veterinary personnel may be called upon to assist with injured animals.

Bird-Aircraft Strike Hazard Management: The Canada goose population in Anchorage greatly expanded during the 1980s and 1990s, to over 4,000 birds by 1997. This can be attributed to an abundance of suitable nesting habitat and increased food sources from fertilized, turfed areas. As the goose population in Anchorage grew so did associated conflicts. Most complaints were related to fecal contamination of lawns, playgrounds, ball fields, and golf courses. On September 22, 1995, an Aircraft Warning and Control System (AWACS) jet from Elmendorf AFB, north of Anchorage, crashed and burned as a result of Canada geese being ingested into and subsequently shutting down two of the four engines as the aircraft lifted off the runway. All 24 Air Force personnel in the aircraft died in the accident.

The tragic incident at Elmendorf AFB has sensitized the community to aircraft safety issues at all local airports. As a direct result of this concern, the USFWS and ADF&G, in 1996, organized the Anchorage Waterfowl Working Group (AWWG). The group, comprised of state and federal agencies along with interested individuals and organizations, has developed a Goose Management Plan and associated Environmental Assessment that is expected to be implemented in 1998.

A summary of the actions planned to reduce the goose problems include a consensus of the AWWG to reduce the Anchorage goose population by half (2,000 geese) within four years. This would include

habitat modification treatments, ongoing public education programs, egg collections, gosling transplants, and lethal methods.

USARAK, in coordination with the Alaska Army National Guard, has instituted a Bird Aircraft Strike Hazard (BASH) program at Bryant Army Airfield. As part of the program, the Army has and will continue to evaluate goose movements and use of the airfield, and the need for habitat modification to reduce aircraft hazards.

The BASH program will develop ways of reducing the air strike hazard by manipulating habitat to decrease the number of birds near the runway. The role of the Natural Resources Branch is to provide technical expertise and make recommendations to Public Works, USARAK Aviation Safety, Airfield Operations, and the Pest Control Branch to reduce bird use of critical areas. The BASH program will include the following features:

- Continue depredation of key nuisance species. The pest management program will repair or place wire on hangers where swallows and pigeons are roosting or nesting.
- Work with all area airfield managers to establish like-minded BASH programs. The Air Force will be using Fort Richardson airfields, beginning in FY 2000. This will require coordination to ensure Army airfields meet Air Force BASH standards.
- Produce education materials for BASH, including videos, posters, handouts, training, bird books, binoculars, etc.
- Purchase equipment used to keep birds off the airfield.
- Attend BASH training workshops and other similar opportunities.
- Attend Army BASH team meetings: A BASH team needs to be developed for Fort Richardson.
- Oversee BASH programs for all three posts (hazing, data collection, and analyzing the results after the BASH season is over).
- Ensure that Public Works, the fire department, and AFS all work together to keep birds off the airfields.
- Oversee the depredation program, particularly for swallows at Fort Richardson.
- Accompany Fort Richardson Airfield Ops at least once a week on their hazing patrols.

5.7.5 Pest Management Program Responsibilities

Pest management is the responsibility of DPW, specifically a Certified Pest Controller. Other organizations involved include PMO game wardens and DPW Environmental Resources. The Pest Management Coordinator for USARAK is within Natural Resources Branch, DPW, Fort Richardson. He is not involved in routine pest management operations, but serves as a technical advisor to the program.

Noxious plant control is carried out by the Fort Richardson Pest Control Shop. The golf course maintains some herbicides and uses its own personnel to apply them. In general, Pest Control Shop personnel apply herbicides on the golf course while the certified applicator at the golf course deals with fungicides.

Noxious animal control responsibility is shared at Fort Richardson. In general, Pest Control Branch, DPW, and the Provost Marshal work within the cantonment area. The Provost Marshal, assisted by ADF&G and the Alaska State Troopers, handles problems with game animals. Animal Damage Control (ADC), US Department of Agriculture, has skills that may be useful in controlling noxious animals.

5.8 Urban Area Management

This section involves management of natural resources within or pertinent to the cantonment area and other urban areas, such as the golf course, ammunition storage areas, and Cottonwood Park.

5.8.1 Urban Area Management Goals

Urban area management goals all contribute to one or more of the overall natural resources program goals of stewardship, military training support, compliance, quality of life, and integration. The urban area management goals for Fort Richardson are:

- Improve urban wildlife habitat.
- Improve aesthetics of recreational areas.
- Enhance quality of life for individuals living and working on Fort Richardson.

5.8.2 Urban Area Planning

Urban area program management and planning includes all the planning, budgeting, contract oversight, and organization necessary to implement the urban area management program. The primary emphasis for this component of the urban area management program is the preparation and update of the landscape management action plan every five years.

5.8.3 Urban Area Monitoring

Urban area monitoring involves surveys of urban areas to identify sick and dying trees, branches and limbs that may cause safety hazards, and new areas that can be landscaped or included in the “no-mow” program.

5.8.4 Urban Area Vegetation Management

Description and Justification: Urban area management involves managing vegetation and wildlife habitat in the cantonment area at Fort Richardson. Managing vegetation involves active landscaping along with a maintenance program. Urban area management is important because it can reduce grounds maintenance costs, reduce pollution, and improve wildlife habitat. Urban area management enhances aesthetics and improves quality of life for soldiers and civilians on Fort Richardson. Urban area management is required by AR 200-3.

Measures of Effectiveness:

- Reduce grounds maintenance costs.
- Receive “Tree City” designation annually.
- Use Alaska native plants and non-invasive ornamentals for landscaping.
- Use construction practices that minimize adverse effects on the natural habitat.
- Reduce pollution by reducing the use of fertilizer and pesticides.
- Practice integrated pest management, the recycling of green waste, and minimize rainwater runoff.
- Implement water-efficient practices.

Management Areas: Priority areas for landscaping are those areas with the highest volume of traffic on post. “No-mow” areas are those areas that have been taken out of the mowing cycle and are being converted back to wildlife habitat.

Management History: Fort Richardson has been designated annually, since 1995, as a “Tree City U.S.A.” by the National Arbor Day Foundation. Landscaping the cantonment area has a long history at Fort Richardson, but a formal landscaping plan was not completed until 1996 (Gossweiler, 1996). This plan is currently being implemented. Improving urban wildlife habitat is a newer program and has been implemented since 1996.

Current Management:

Urban Area Vegetation Management: Fort Richardson has parcels of mature native forest adjacent to cleared sites within the cantonment area. In addition, large cleared areas around buildings have been planted with native and ornamental trees and shrubs. Together this constitutes an “urban forest” setting in the cantonment area. In the past, mortality of the planted trees was high and required replacement on a yearly basis. Practices today result in fewer trees being planted each year with more time being devoted to watering and other maintenance needs. Planting bigger, hardier trees and shrubs, although initially more expensive, has proven to be more economical in the long run. In some instances, professional landscaping companies are being contracted to plant trees and shrubs, if they provide at least a two-year survival guarantee.

A Landscape Management Plan (Gossweiler, 1996) has been prepared and is currently being implemented. Trees and shrubs chosen for landscaping on the cantonment area have been selected from a recommended list of landscaping materials for southcentral Alaska. Two complete references for landscaping materials for Fort Richardson are the *Directory of Alaska Landscape Plant Sources* (Alaska Plant Materials Center, 1994) and the *Landscape Design Guide for the 6th Infantry Division (Alaska)* (David Evans and Associates, Inc., 1987).

Whenever possible, USARAK will use native species transplanted from surrounding areas for landscaping developed areas. Trees can be transplanted using a front end loader since their roots are only about 8-10 inches deep. Both native and ornamental species will be purchased and used for aesthetic purposes. Non-invasive ornamentals to be used include crabapple (*Malus* spp.), lilacs (*Syringa* spp.), flowering almond (*Prunus glandulosa*), shrub dogwood (*Cornus* spp.), maple (*Acer ginnala*), cotoneaster (*Cotoneaster* spp.), Canada red cherry (*Prunus virginiana*), Colorado blue spruce (*Picea pungens*), May Day tree (*Prunus padus*), weeping birch (*Betula pendula*), etc. These will provide color on road medians, in front of dark treelines, around Otter Lake, etc., and will not out-compete native species or invade other areas.

Attempts will be made to reduce the high mortality of trees transplanted in the cantonment area. Emphasis will be placed on planting fewer trees in a given year and improving efforts to protect them. This will require installing effective tree guards such as metal stakes, guying the trees to prevent damage during high winds, and the use of tree trunk guards to prevent sun scalding. Educational efforts also need to be directed to turf maintenance operators to avoid close mowing of grass next to large trees. The mower often makes contact with the tree, damaging the bark, and providing an opportunity for disease or insect damage to occur. This can result in the mortality of damaged trees.

Spruce bark beetles have infested spruce trees within and adjacent to the cantonment area. This beetle prefers larger trees, that have more ornamental appeal, and their mortality rate can be very high. Primary techniques for preventing infestation are:

- Avoiding damage to trees during construction and other activities.
- Removing damaged trees, especially wind-thrown trees and stumps, and pruning debris prior to mid-May.
- Pruning lower branches of full-crowned spruce in the fall.

- Thinning denser stands to reduce competition and increase tree vigor.
- Promoting healthy trees by proper watering and fertilization.
- Spraying appropriate pesticides prior to the end of May.

Current practice is to use the pesticide Sevin SL® on trees greater than six inches in diameter. The Cooperative Extension Service (1991) has a publication, *Spruce Bark Beetles, Control Options for the Home or Lot Owner*, which can help identify infected trees and details prevention and control options. Another publication, *Spruce Bark Beetles in Firewood* (ADNR, 1992), provides ways to minimize the spread of spruce beetles by properly using firewood. When killed by bark beetles, white spruce trees serving ornamental and aesthetic purposes in the cantonment area will be replaced with beetle-resistant conifers such as Colorado blue spruce.

Fort Richardson has been designated as a “Tree City U.S.A.” by the National Arbor Day Foundation since 1995, and will seek to maintain that designation in 2002-2006. This status depends upon an annual Arbor Day celebration, with a proclamation issued by the Post Commander, a tree ordinance with policies for tree planting and maintenance, establishment of a Tree Board to plan and maintain the tree management program, and an annual expenditure of at least \$2 per capita on urban tree management.

Urban Area Habitat Management: Emphasis on managing urban wildlife has opened new avenues for resource management. An emerging awareness that urban areas can be managed for wildlife and still be attractive, combined with reduced funding for grounds maintenance, has created new opportunities for habitat management within Fort Richardson’s cantonment area.

Programs for reducing grounds maintenance involve decreasing mowing and establishing forest, grassland, and wildflower areas to lower maintenance costs on improved and semi-improved grounds. The tradition of neatly manicured grass on military installations can be hard to change, but natural resources staff is working to generate acceptance of these programs.

The predominance of manicured lawns on military installations emerged in the 1950s with the hiring of agronomists. These programs were given big boosts in the late 1960s by Lady Bird Johnson, and her emphasis on beautification. Maintaining this appearance, however, is becoming prohibitively expensive. Fort Sill, the installation that has won the most Communities of Excellence competitions, has removed about 700 acres from its mowing schedule, and is now converting this land to wildlife habitat, saving tens of thousands of dollars in maintenance costs.

“No-mow” is a designation for areas that are dropped from the grass mowing cycle. These areas are accepted by the public most readily when they are natural extensions of already wild lands, such as narrowing a mowed road shoulder or the extension of a woody area into a field.

During the first season of transition to a “no-mow” status, some areas may be somewhat unsightly due to growth of undesirable plants. Herbicides may be needed to eliminate invading exotic species and to promote faster recovery of native vegetation. This herbicide use, particularly spot treatment, may cause some temporary eyesores. There are also increased pest problems associated with wildlands near buildings. Experience on other installations, however, has shown that these problems are relatively minor. Over the long-term, “no-mow” areas save money; Fort Sill calculated that savings would be about \$10,000 annually for every 100 acres removed from mowing.

Fort Richardson has reduced grounds maintenance on the cantonment area in recent years by decreasing the size of maintained turfed areas. The greatest benefits have been gained by reducing the width of turfed areas along roads and streets by 10 to 20 percent. Sections of turfed areas furthest from roads and streets are no longer maintained and are allowed to revert back to a natural state. In some places tree lines are

being established in front of areas to be removed from mowing. Remote areas on the cantonment such as the Warehouse Loop also have been removed from routine grounds maintenance.

The acceptance wildflower plantings is growing nationwide. This is probably an off-shoot of the publicity given to the roadside wildflower program in Texas and other places. Wildflowers can be established at Fort Richardson, but success has not been good to date. The science of establishing wildflowers is specific to regions, and many aspects of wildflower plantings in Alaska are not well understood. There also are problems with obtaining sufficient quantities of seed. In addition, these wildflower areas must be mowed annually, and they must often be replanted from time to time. Planting requires specialized equipment and seed mixtures.

Wildflowers were tried at Fort Richardson. With few exceptions, results were aesthetically and economically unsatisfactory. During 2002-2006, specific plantings of wildflowers will not be undertaken unless special circumstances dictate otherwise. The goal with regard to wildflowers is to let them occur naturally in “no-mow” sites.

Proposed Management: Continue the implementation of urban area vegetation management on Fort Richardson as outlined in Table 5-24.

Table 5-24. Urban Area Vegetation Management.

OBJECTIVE	RESPONSIBLE FOR IMPLEMENTATION	PRIORITY	IMPLEMENTATION				
			2002	2003	2004	2005	2006
Apply annually to be designated as a “Tree City U.S.A.”	USARAK Natural Resources	Low	x	x	x	x	x
Install 5 acres of new landscaping plantings annually in the cantonment areas.	USARAK Natural Resources	Low	x	x	x	x	x

Other Management Alternatives Considered and Eliminated: There are other potential methods for conducting urban area vegetation management. The proposed management actions, however, carefully balance economic and ecological considerations, and the aesthetics of vegetation management in urban areas on Fort Richardson. Other actions would be too minimal or would be cost-prohibitive.

5.8.5 Urban Area Management Responsibilities

Routine grounds maintenance on Fort Richardson is conducted primarily by Roads and Grounds Maintenance, DPW. The Natural Resources Branch provides some professional assistance to Roads and Grounds Maintenance, but most of this program is not included in this section.

Figure 5-1. Environmental Limitations Overlay.

Figure 5-2. Forest Management Areas.

Figure 5-3. Fort Richardson Fire History.

Figure 5-4. Fire Management Areas.

Figure 5-5. Fisheries Management Areas.

Figure 5-6. ADF&G Game Management Units.

Figure 5-7. Habitat Management Areas.